DOCUMENT RESUME

ED 279 817 CE 046 478

TITLE	Machine Shop I. Learning Activity Packets (LAPs). Section B--Basic and Related Technology.
INSTITUTION	Oklahoma State Board of Vocational and Technical Education, Stillwater. Curriculum and Instructional Materials Center.
PUB DATE	84
NOTE	249p.; For related documents, see ED 212 879 and CE 046 477-480.
AVAILABLE FROM	Curriculum and Instructional Materials Center, Oklahoma State Board of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, OK 74074 (Order No. TI 0102--$22.00; slides and audiotapes--$258.00).
PUB TYPE	Guides - Classroom Use - Materials (For Learner) (051)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Blueprints; Industrial Arts; *Instrumentation; *Job Skills; Learning Activities; *Machine Tool Operators; *Machine Tools; Mathematical Applications; Measurement; *Measurement Equipment; *Measurement Techniques; Postsecondary Education; Secondary Education; Skill Development; State Curriculum Guides; Vocational Education
IDENTIFIERS	Oklahoma

ABSTRACT

This document contains eight learning activity packets (LAPs) for the "basic and related technology" instructional area of a Machine Shop I course. The eight LAPs cover the following topics: basic mathematics, blueprints, rules, micrometer measuring tools, Vernier measuring tools, dial indicators, gaging and inspection tools, and materials and cutting fluids. Each LAP contains a cover sheet that describes its purpose, an introduction, and the tasks included in the LAP; learning steps (checklist); pretest; and various assignment sheets. Materials are illustrated with line drawings. The LAPs are referenced to a curriculum guide for the Machine Shop I course. (KC)

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ED279817

Learning Activity Packets (LAPs)

Machine Shop I

Section B — Basic and Related Technology

LAP #3 — Basic Math
LAP #4 — Blueprints
LAP #5 — Rules
LAP #6 — Micrometer Measuring Tools
LAP #7 — Vernier Measuring Tools
LAP #8 — Dial Indicators
LAP #9 — Gaging and Inspection Tools
LAP #10 — Materials and Cutting Fluids

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State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for MACHINE SHOP I

LAP NO. _____ CODE: _____

MAJOR INSTRUCTIONAL AREA

BASIC AND RELATED TECHNOLOGY

INSTRUCTIONAL UNIT

BASIC MATH
SECTION B--UNIT I

LEARNING ACTIVITY PACKET NO.

3

PREREQUISITE LAP(S)

1

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities for "Basic Math." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training.

INTRODUCTION: The course of study in this LAP will help the student become able to calculate problems using fractions and decimals.

TASKS INCLUDED IN THIS LAP:

None

MACHINE SHOP I
BASIC MATH

SECTION B--UNIT I

LEARNING STEPS

Check the Following
Blanks as You Complete
Each Required Step

_____1.	Read	Unit and Specific Objectives, page 1-B.
_____2.	Complete	Basic Math Pre-Test, LAP page 5.
_____3.	Study	The Sections of the Information Sheet, pages 5-B through 12-B, indicated on your Pre-Test. Be sure to study the transparency masters when required.
_____4.	Refer	To Step 18 of your Pre-Test. If study is indicated for Section I, continue to Step 5. Otherwise, proceed to Step 6.
_____5.	Do	LAP Assignment Sheet #1, LAP page 13.
_____6.	Refer	To Step 18 of your Pre-Test. If study is indicated for any of Sections II through VI, continue to Step 7. Otherwise, proceed to Step 10.
_____7.	Do	Assignment Sheet #1--Change Fractions, page 19-B.
_____8.	Stop.	Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 10. Otherwise, continue to Step 9.

_____9.	Do	LAP Assignment Sheet #2, LAP page 15.
_____10.	Refer	To Step 18 of your Pre-Test. If additional study is indicated for either Section VII or Section VIII, continue to Step 11. Otherwise, proceed to Step 14.
_____11.	Do	Assignment Sheet #2--Add and Subtract Fractions, page 25-B.
_____12.	Stop.	Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 14. Otherwise, continue to Step 13.
_____13.	Do	LAP Assignment Sheet #3, LAP page 19.
_____14.	Refer	To Step 18 of your Pre-Test. If additional study is indicated for either Section IX or X, continue to Step 15. Otherwise, proceed to Step 18.
_____15.	Do	Assignment Sheet #3--Multiply and Divide Fractions, page 31-B.
_____16.	Stop.	Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 18. Otherwise, continue to Step 17.
_____17.	Do	LAP Assignment Sheet #4, LAP page 23.
_____18.	Refer	To Step 18 of your Pre-Test. If additional study is indicated for Section XI, continue to Step 19. Otherwise, proceed to Step 20.
_____19.	Do	LAP Assignment Sheet #5, LAP page 27.

_____20. Refer — To Step 18 of your Pre-Test. If additional study is indicated for any of Sections XII - XIV, continue to Step 21. Otherwise, proceed to Step 24.

_____21. Do — Assignment Sheet #4--Convert Fractions and Decimal Fractions, page 35-B.

_____22. Stop. — Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 24. Otherwise, continue to Step 23.

_____23. Do — LAP Assignment Sheet #6, LAP page 29.

_____24. Refer — To Step 18 of your Pre-Test. If additional study is indicated for Section XV, continue to Step 25. Otherwise, proceed to Step 28.

_____25. Do — Assignment Sheet #5--Add and Subtract Decimal Fractions, page 39-B.

_____26. Stop. — Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 28. Otherwise, continue to Step 27.

_____27. Do — LAP Assignment Sheet #7, LAP page 31.

_____28. Refer — To Step 18 of your Pre-Test. If additional study is indicated for Section XVI, continue to Step 29. Otherwise, proceed to Step 32.

_____29. Do — Assignment Sheet #6--Multiply Decimal Fractions, page 43-B.

_____30. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 32. Otherwise, continue to Step 31.

_____31. Do LAP Assignment Sheet #8, LAP page 35.

_____32. Refer To Step 18 of your Pre-Test. If additional study is indicated for Section XVII, continue to Step 33. Otherwise, proceed to Step 36.

_____33. Do Assignment Sheet #7--Divide Decimal Fractions, page 45-B.

_____34. Stop Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 36. Otherwise, continue to Step 35.

_____35. Do LAP Assignment Sheet #9, LAP page 37.

_____36. Review Information Sheet (page 5-B) and Assignment Sheets.

_____37. Take Basic Math Unit I Test (see your instructor). If you achieve a score of 85 percent or more, continue to the next assigned Learning Activity Packet. Otherwise, talk with your instructor about additional training requirements and possible retesting.

BASIC MATH
UNIT I

PRE-TEST

NAME _____ SCORE _____

DIRECTIONS: This test is to determine how much you already know about basic math. Your performance on this test will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you are certain of the answer. Guessing may prevent you from receiving the lessons which are required.

1. Match terms associated with fractions and decimal fractions to their correct definitions. Write the correct numbers in the blanks provided. Definitions continue on next page.

_____a.	The portion of the whole that is being considered; written above the line.	1.	Fraction
_____b.	Dividing both parts of a fraction by the same number in order to make it easier to read; does not change the value.	2.	Denominator
_____c.	The scale of the decimal, such as tenths, hundredths, etc.	3.	Numerator
_____d.	Fraction that has been converted into a decimal.	4.	Improper fraction
_____e.	Rounding off to the nearest number.	5.	Mixed number
_____f.	A whole number and a fraction that have been combined.	6.	Reducing
_____g.	A part of a whole; written as two numbers separated by a line.	7.	Decimal fraction
_____h.	The numerator is larger than the denominator, making it larger than a whole unit.	8.	Number
_____i.	Tells the number of equal parts something is divided into; written below the line.	9.	Decimal equivalent
_____j.	Two numbers with unlike denominators.	10.	Lowest common denominator
_____k.	The smallest number into which two or more denominators can be divided without leaving a remainder.		

_____l. A decimal number which equals the denominator of a given fraction.

_____m. One or more whole units.

_____n. A fraction whose denominator is a power of 10, such as 10, 100 etc. The denominator is omitted and a decimal point is written to the left of the numerator with as many numbers to the right of the decimal point as there were 0's in the denominator.

2. Reduce each of the following fractions to lowest terms.

a. 8/16 = _____ b. 4/32 = _____

c. 4/6 = _____ d. 10/25 = _____

e. 13/39 = _____ f. 58/64 = _____

3. Convert each of the following fractions to an equivalent fraction.

EXAMPLES: 1/3 = 4/12 or 3/9 or 8/24 etc.

a. 3/4 = _____ b. 5/16 = _____ c. 3/32 = _____

d. 4/19 = _____ e. 31/64 = _____ f. 7/10 = _____

4. Change each of the following mixed numbers to an improper fraction.

a. 6 1/3 = _____ b. 2 7/8 = _____ c. 3 9/16 = _____

d. 4 1/2 = _____ e. 5 8/13 = _____ f. 1 41/64 = _____

5. Change each of the following improper fractions to a mixed number. Reduce fractions to lowest terms.

a. 31/4 = _____ b. 21/16 = _____ c. 121/32 = _____

d. 256/64 = _____ e. 37/5 = _____ f. 108/8 = _____

6. Determine the lowest common denominator for the following numbers. Write the denominator in the blank provided.

_____a. 1/2, 2/3, 3/5

_____b. 1 9/16, 7, 3 7/8

_____c. 1/10, 4 9/32, 1/4

7. Add the following numbers. Give your answer in lowest terms.

   a. 3/16 + 3/8 + 3/4 = _____

   b. 7/64 + 29/32 + 1 1/16 = _____

   c. 1/2 + 17/24 + 4 7/8 = _____

   d. 2 1/2 + 1/2 + 7/64 = _____

   e. 1 9/10 + 3/4 + 3/4 = _____

8. Subtract the following fractions and reduce to lowest terms.

   a. 9/10 - 1/5 = _____ b. 1 7/8 - 19/64 = _____

c. 7/8 - 1/3 = _____ d. 2 1/2 - 7/10 = _____

e. 3 1/8 - 3/4 = _____

9. Multiply the following numbers and reduce to lowest terms.

a. 1 5/16 x 2 1/32 = _____ b. 1 13/16 x 4 1/2 = _____

c. 1/4 x 9/10 = _____ d. 7/8 x 2 1/3 = _____

e. 1 7/8 x 1 3/4 x 1 3/16 = _____

10. Divide the following numbers. Give your answer in lowest terms.

a. 7/8 ÷ 1/2 = _____ b. 2 1/3 ÷ 4 = _____

c. $3\ 1/3 \div 4\ 7/16 =$ _____ d. $21/64 \div 1\ 1/10 =$ _____

e. $5\ 2/3 \div 1/8 =$ _____

11. Construct the decimal number system by telling what decimal place is represented by each digit in the following numbers.

7641.205829

EXAMPLE: 7 thousand
5 thousandths

a. 1 = _____ 6 = _____

2 = _____ 8 = _____

3 = _____ 9 = _____

4 = _____ 0 = _____

31,962.57480

b. 1 = _____ 6 = _____

2 = _____ 7 = _____

3 = _____ 8 = _____

4 = _____ 9 = _____

5 = _____ 0 = _____

12. Write the decimal fraction for each of the following.

a. Thirty-one ten-thousandths = _____

b. Nine-tenths = _____

c. Three-hundred-twenty-nine thousandths = _____

d. Seventeen-hundredths = _____

e. Fifty-four thousandths = _____

13. Convert each of the following fractions to its decimal fraction equivalent. Carry your answer to the fourth place.

    EXAMPLE: 1/4 = .2500

    a. 1/2 = _____ b. 21/64 = _____

    c. 14/15 = _____ d. 3 1/3 = _____

    d. 19/32 = _____

14. Write each of the following numbers out in words.

    a. .0140 = _____

    b. 2.7001 = _____

    c. .3900 = _____

    d. .0404 = _____

    e 1.7310 = _____

15. Add or subtract the following numbers as indicated.

    a. 1.73 + .011 + 3.7 + .68 = _____

    b. .1625 + 1.8 + .009 = _____

    c. 4.91 - 4.0006 = _____

d. $1.0301 + 19 + 2.677 - 8.231 =$ _____

e. $1.27 - .0081 - .125 =$ _____

16. Multiply the following numbers.

a. $7.2 \times .1277 =$ _____ b. $.0198 \times .7777 =$ _____

c. $2.5 \times .0006 =$ _____ d. $1.111 \times 20 =$ _____

e. $.0739 \times .0986 =$ _____

17. Divide the following numbers. Carry your answers to the fourth decimal place.

a. $17.19 \div 4 =$ _____ b. $.1635 \div .4 =$ _____

c. $.144 \div 2.8701 =$ _____ d. $2.653 \div 1.01 =$ _____

e. $.4841 \div .0793 =$ _____

18. Stop. Have your instructor evaluate your Pre-Test and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

_____I _____X

_____II _____XI

_____III _____XII

_____IV _____XIII

_____V _____XIV

_____VI _____XV

_____VII _____XVI

_____VIII _____XVII

_____IX

If none of the above study areas are checked, continue to the next assigned LAP. Otherwise, go to LAP Step 3.

BASIC MATH
UNIT I

LAP ASSIGNMENT SHEET #1--BASIC MATH TERMS

NAME_____ SCORE_____

1. This Assignment Sheet is backwards. Below are the answers to questions. Write the question after each answer that is given.

   a. Answer: The portion of the whole that is being considered; written above the line.

      Question: _____

      _____

   b. Answer: Dividing both parts of a fraction by the same number in order to make it easier to read; this does not change the value.

      Question: _____

      _____

   c. Answer: Fraction that has been converted into a decimal.

      Question: _____

      _____

   d. Answer: A whole number and a fraction that have been combined.

      Question: _____

      _____

   e. Answer: As two numbers separated by a line; this shows that it is part of a whole.

      Question: _____

      _____

   f. Answer: The numerator is larger than the denominator, making it larger than a whole unit.

      Question: _____

      _____

g. Answer: Tells the number of equal parts something is divided into; written below the line.

Question: _____

_____

h. Answer: The smallest number into which two or more denominators can be divided without leaving a remainder.

Question: _____

_____

i. Answer: One or more whole units.

Question: _____

_____

j. Answer: A fraction whose denominator is a power of 10, such as 10, 100, etc. The denominator is omitted and a decimal point is written to the left of the numerator with as many numbers to the right of the decimal point as were the 0's in the denominator.

Question: _____

_____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 6. Otherwise, study Section I of the Information Sheet before going to LAP Step 6.

BASIC MATH
UNIT I

LAP ASSIGNMENT SHEET #2--CHANGE FRACTIONS

NAME_____ SCORE_____

1. Reduce each of the fractions to lowest terms. Show your work on all problems.

   a. 14/32 =

   b. 15/65 =

   c. 24/52 =

   d. 12/16 =

2. Convert the following fractions to equivalent fractions having the denominators shown. Show your work on all problems.

   a. 3/4 = /48

   b. 8/15 = /60

c. 8/32 = /64

d. 1/4 = /100

3. Change the following mixed numbers to improper fractions. Show your work on all problems.

a. 2 5/32 =

b. 1 37/64 =

b. 3 2/3 =

d. 5 73/100 =

4. Change the following improper fractions to mixed numbers. Give your answer in simplest terms. Show your work on all problems.

a. 37/9 =

b. 287/100 =

c. 23/16 =

d. 314/64 =

5. Determine the lowest common denominator in each group of fractions.

_____a. 1/3, 3/4, 5/16, and 1/8

_____b. 3/16, 1/32, 5/8, and 1/4

_____c. 2/5, 1/64, 1/3, and 3/8

_____d. 7/8, 1/12, 5/6, and 3/4

6. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 10. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 10.

BASIC MATH
UNIT I

LAP ASSIGNMENT SHEET #3--ADD AND SUBTRACT FRACTIONS

NAME_____ SCORE_____

1. Add the following numbers. Show your work and give your answers in simplest terms.

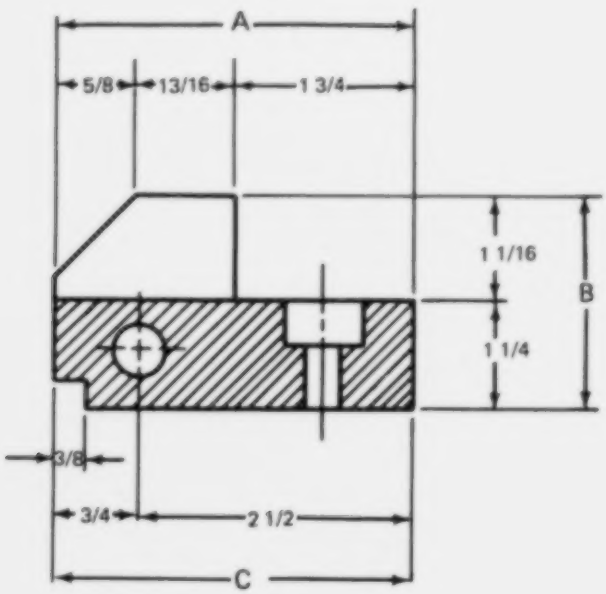
   a. 3/8 + 1/4 = _____

   b. 3/32 + 7/64 = _____

   c. 1 7/8 + 2 5/16 = _____

   d. 15/32 + 57/64 = _____

2. Determine the dimensions of A, B, and C. Show your work and give your answers in simplest terms on the next page.



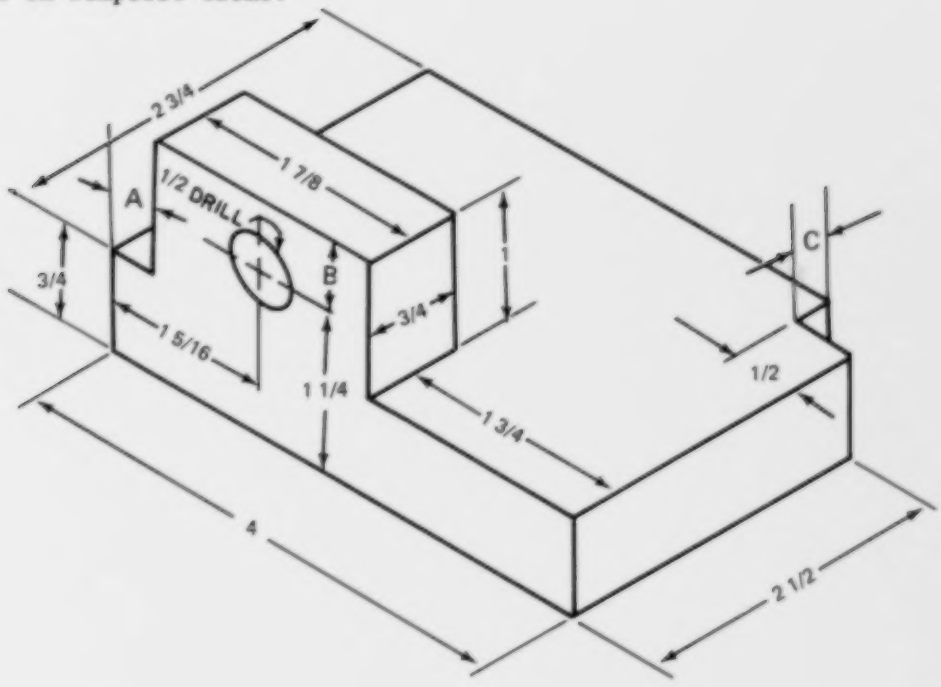
a._____ b._____ c._____

3. Subtract the following numbers. Show your work and give your answers in simplest terms.

a. 31/32 - 5/16 = _____ b. 2 3/4 - 3/10 = _____

c. 1/3 - 3/64 = _____ d. 7 3/16 - 4 37/64 = _____

4. Determine the dimension of A, B, and C. Show your work and give your answers in simplest terms.



a._____ b._____ c._____

5. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 14. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 14.

BASIC MATH
UNIT I

LAP ASSIGNMENT SHEET #4--MULTIPLY AND DIVIDE FRACTIONS

NAME_____ SCORE_____

1. Multiply the following numbers. Show your work and reduce your answers to simplest terms.

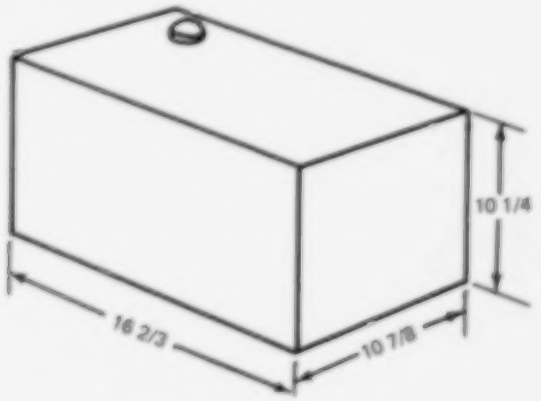
   a. 2/3 x 1/2 = _____

   b. 3/16 x 1 1/4 = _____

   c. 2 3/8 x 1 1/10 = _____

   d. 4/19 x 3 x 2 1/2 = _____

2. In order to mix a solution of cutting fluid you must determine the volume of the coolant tank. If the inside of the tank measures 16 2/3 inches long, 10 7/8 inches wide, and 10 1/4 inches deep, what is the volume? (Volume = length x width x height)



Volume = _____ cubic inches

(NOTE: Show your work below.)

3. Divide the following numbers. Show your work and reduce your answers to simplest terms.

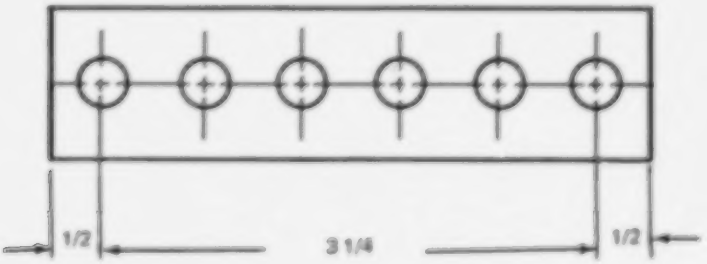
a. $7 \div 3/8 =$ _____

b. $15/16 \div 1/4 =$ _____

c. $31/64 \div 4 =$ _____

d. $1\ 3/16 \div 1/2 =$ _____

4. The bar shown below has 6 holes equally spaced. Determine the distance between the centers of adjacent holes. Show your work in the space below.



x = _____ inches

5. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 18. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 18.

BASIC MATH
UNIT I

LAP ASSIGNMENT SHEET #5--CONSTRUCT DECIMAL NUMBER SYSTEM

NAME _____ SCORE _____

1. Identify the value of the digit underlined in each of the following numbers by choosing the correct term from the list below. Write the term in the blank provided.

Millions	Thousandths
Units	Thousands
Tenths	Hundred-thousandths
Ten-Thousandths	Hundreds
Hundred-thousands	Tens
Millionths	Ten-thousands
Hundredths	

a. 1.0$\underline{7}$ _____

b. 1,0$\underline{7}$0 _____

c. $\underline{1}$0,704.13 _____

d. .073$\underline{6}$ _____

e. $\underline{9}$.81 _____

f. 91.$\underline{8}$1 _____

g. $\underline{1}$37 _____

h. 3.00$\underline{1}$79 _____

i. $\underline{4}$,817,326 _____

j. 7.039$\underline{1}$602 _____

k. $\underline{1}$941.1941 _____

l. 2.00000$\underline{2}$ _____

m. $\underline{5}$87,416.2 _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 20. If additional study is required, study Section X of the Information Sheet and then go to LAP Step 20.

BASIC MATH
UNIT

LAP ASSIGNMENT SHEET #6--CONVERT FRACTIONS AND DECIMAL FRACTIONS

NAME_____ SCORE_____

1. Convert each of the following fractions or mixed numbers to its decimal equivalent. This is done by dividing the numerator by the denominator. Show your work and carry your answer to the fourth decimal place.

EXAMPLE: 1/8 = .1250

```
      .1250
   8 | 1.0000
       8
       20
       16
       40
       40
```

a. 3/64 = _____

b. 9/16 = _____

c. 3/10 = _____

d. 3/4 = _____

e. 1 7/8 = _____

f. 13 1/4 = _____

2. Write the following as a decimal number.

a. Thirty-one ten-thousandths = _____

b. Eight hundred and one and four-tenths = _____

c. One and sixty-four millionths = _____

d. Seven hundred ninety-one thousandths = _____

e. Seven hundred ninety and one-thousandth = _____

3. Express the following decimal numbers in words.

a. .10101 _____

_____

b. 144.4 _____

_____

c. 2.00037 _____

_____

d. 1010.1 _____

_____

e. 47.74 _____

_____

4. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 25. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 25.

BASIC MATH
UNIT I

LAP ASSIGNMENT SHEET #7--ADD AND SUBTRACT DECIMAL FRACTIONS

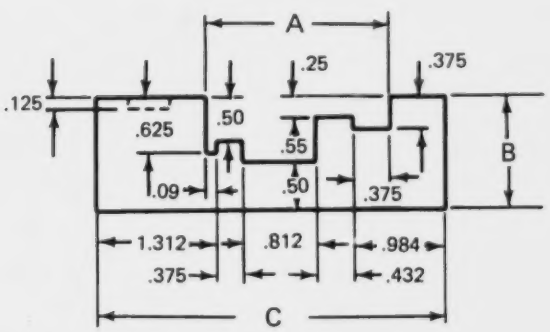
NAME_____ SCORE_____

1. Add the following decimal fractions. Show your work.

   a. 1.731 + .67 = .0003 = _____

   b. 9.61 + .01003 + 2.500 = _____

2. Determine the dimensions of A, B, and C. Show your work.



a._____ b._____ c._____

3. Subtract the following decimal fractions. Show your work.

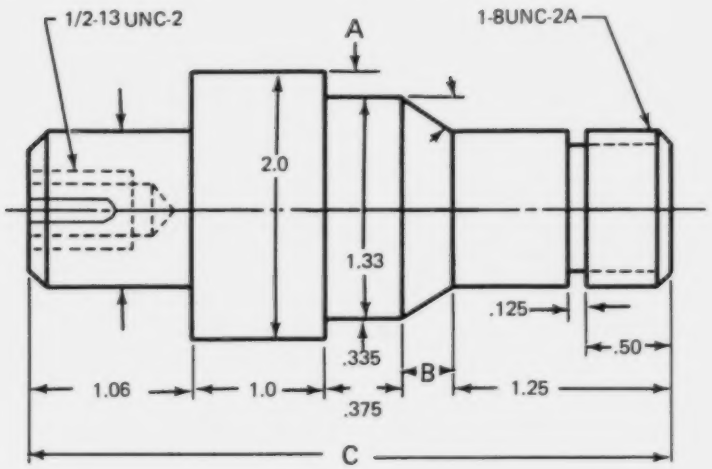
a. 7.602 - 3.002 = _____

b. .316 - .060 = _____

c. 4.1193 - 1.5 = _____

d. 1.001 - .101 = _____

4. Determine dimensions A, B, and C. Show your work.



a. _____ b. _____ c. _____

5. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 28. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 28.

BASIC MATH
UNIT I

LAP ASSIGNMENT SHEET #8--MULTIPLY DECIMAL FRACTIONS

NAME_____ SCORE_____

1. Multiply the following numbers. Show your work.

   a. 2.76 x 1.003 x 1.14 = _____

   b. 7.11 x .0101 x 9 = _____

   c. 14 x .3333 = _____

   d. 4.68 x 2.0012 = _____

2. Eighteen 2.175 inch parts were cut from a steel bar. Each cut lost .211 inches for the saw cut. After the parts were cut, 1.365 inches of bar were left over. What was the original length of the steel bar?_____ inches.

3. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 32. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 32.

BASIC MATH
UNIT I

LAP ASSIGNMENT SHEET #9--DIVIDE DECIMAL FRACTIONS

NAME_____ SCORE_____

1. Divide the following numbers. Carry your answers out to four places. Show your work.

   a. $1.622 \div 2.17 =$ _____

   b. $3.74 \div 2 =$ _____

   c. $.0014 \div .997 =$ _____

d. $4.1 \div 2.663 =$ _____

e. $7.4 \div 7.04 =$ _____

2. How many parts 6.25 inches long can be cut from an 8-foot steel bar if the saw cut removes .175 inches with each cut? How much material will be left over after the parts are cut?

   a. Number of parts = _____

   b. Remaining material = _____ inches.

3. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 36. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 36.

State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for MACHINE SHOP I

LAP NO._____ CODE:_____

MAJOR INSTRUCTIONAL AREA

BASIC AND RELATED TECHNOLOGY

INSTRUCTIONAL UNIT

BLUEPRINTS
SECTION B--UNIT II

LEARNING ACTIVITY PACKET NO.

4

PREREQUISITE LAP(S)

1

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities for "Blueprints." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training.

INTRODUCTION: The course of study in this LAP will help the student become able to interpret blueprint symbols, lines, abbreviations, and industrial blueprints and to construct views using orthographic projections.

TASKS INCLUDED IN THIS LAP:

None

MACHINE SHOP I
BLUEPRINTS
SECTION B--UNIT II

LEARNING STEPS

Check the Following
Blanks as You Complete
Each Required Step.

_____1.	Read	Unit and Specific Objectives, page 67-B.
_____2.	Complete	Blueprints Pre-Test, LAP page 7.
_____3.	Study	The Sections of the Information Sheet, pages 71-B through 100-B, indicated on your Pre-Test. Be sure to study the transparency master if study in Section IX is required.
_____4.	Refer	To Step 12 of your Pre-Test. If additional study is indicated for Section I, continue to Step 5. Otherwise, proceed to Step 7.
_____5.	Do	LAP Assignment Sheet #1, LAP page 25.
_____6.	Do	LAP Assignment Sheet #2, LAP page 29.
_____7.	Refer	To Step 12 of your Pre-Test. If additional study is indicated for Section II, continue to Step 8. Otherwise, proceed to Step 11.
_____8.	Do	Assignment Sheet #1--Match Blueprint Symbols to Their Definitions, page 103-B.
_____9.	Stop.	Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 11. Otherwise, continue to Step 10.

_____10. Do — LAP Assignment Sheet #3, LAP page 33.

_____11. Refer — To Step 12 of your Pre-Test. If additional study is indicated for Section III, continue to Step 12. Otherwise, proceed to Step 15.

_____12. Do — Assignment Sheet #2--Write Meanings of Abbreviations Used on Blueprints, page 105-B.

_____13. Stop. — Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 15. Otherwise, continue to Step 14.

_____14. Do — LAP Assignment Sheet 4, LAP page 35.

_____15. Refer — To Step 12 of your Pre-Test. If additional study is indicated for Section IV, continue to Step 16. Otherwise, proceed to Step 19.

_____16. Do — Assignment Sheet #3--Identify Lines on Blueprints, page 107-B.

_____17. Stop. — Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 19. Otherwise, continue to Step 18.

_____18. Do — LAP Assignment Sheet #5, LAP page 37.

_____19. Refer — To Step 12 of your Pre-Test. If additional study is indicated for Section V, continue to Step 20. Otherwise, proceed to Step 24.

_____20. Do — Assignment Sheet #4--Complete Orthographic Projection Drawings, page 111-B.

_____21. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 23. Otherwise, continue to Step 22.

_____22. Do Assignment Sheet #7--Sketch Orthographic Projections, page 117-B.

_____23. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to Step 24. If additional study is required discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Step 24.

____24. Refer To Step 12 of your Pre-Test. If additional study is indicated for Section VI, continue to Step 25. Otherwise, proceed to Step 28.

_____25. Do Assignment Sheet #5--Identify Other Views of Blueprints, page 113-B.

_____26. Stop Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 28. Otherwise, continue to Step 27.

_____27. Do LAP Assignment Sheet #6, LAP page 39.

_____28. Refer To Step 12 of your Pre-Test. If additional study is indicated for either Section VII or Section VIII, continue to Step 29. Otherwise, proceed to Step 31.

_____29. Do LAP Assignment Sheet #7, LAP page 41.

_____30. Do LAP Assignment Sheet #8, LAP page 43.

_____31. Refer — To Step 12 of your Pre-Test. If additional study is indicated for Section IX, continue to Step 32. Otherwise, proceed to Step 35.

_____32. Do — Assignment Sheet #6--Locate Information on the Title Block, page 115-B.

_____33. Stop. — Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 35. Otherwise, continue to Step 34.

_____34. Do — LAP Assignment Sheet #9, LAP page 45.

_____35. Refer — To Step 12 of your Pre-Test. If additional study is indicated for Section X, continue to Step 36. Otherwise, proceed to Step 39.

_____36. Do — Assignment Sheet #8--Identify Machining Specifications and Processes, page 123-B.

_____37. Stop — Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 39. Otherwise, continue to Step 38.

_____38. Do — LAP Assignment Sheet #10, LAP page 47.

_____39. Refer — To Step 12 of your Pre-Test. If additional study is indicated for Read Industrial Blueprints, continue to Step 40. Otherwise, proceed to Step 44.

_____40. Do — Assignment Sheet #9--Read Blueprints, page 129-B.

_____41. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to Step 44. Otherwise, continue to Step 42.

_____42. Do Assignment Sheet #10--Read an Industrial Blueprint, page 133-B.

_____43. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to Step 44. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Step 44.

_____44. Review Information Sheet (page 71-B) and Assignment Sheets.

_____45. Take Blueprints Unit II Test (see your instructor). If you score 85 percent or more, continue to the next assigned Learning Activity Packet. Otherwise, discuss additional study requirements and possible re-testing with your instructor.

MACHINE SHOP I
BLUEPRINTS
UNIT II
PRE-TEST

NAME _____ SCORE _____

DIRECTIONS: This test is to determine how much you already know about blueprints. Your performance on this test will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which your are certain of the answer. Guessing may prevent you from receiving the lessons which are required.

1. Match blueprint terms to their definitions. Write the number of the term in the blank beside its correct definition. Definitions for Section I continue on the next page.

Section I

_____a. The process of flattening the face of a machined part

_____b. The process of lapping finished parts to very close tolerances, leaving the surface very smooth

_____c. The process of enlarging a portion of a hole to a specific diameter and depth, usually greater than .030 inch

_____d. The process of grinding a shoulder on a diameter, called a lap

_____e. The process of making a flat surface perpendicular to a specific diameter and depth, usually less than .030 inch

_____f. The process of heating a metal piece to a high temperature to soften it, and allowing it to cool slowly

_____g. The process of cutting a relief in a diameter near a shoulder

_____h. The process of hardening the outer surface of a steel part, forming a hard case on the metal while leaving the inner metal soft

_____i. The process of finishing a drilled hole to an accurate size

_____j. The process of threading a hole counterclockwise instead of clockwise

1. Drill
2. Grind
3. Anneal
4. Lap
5. Spot face
6. Ream
7. Chamfer
8. Countersink
9. Case harden
10. Carburize
11. Counterbore

_____k. The process of tapering the top of a hole at a specific angle

_____l. The process of originating a hole by using a drill

_____m. To remove a sharp external edge with a cutting tool, usually at an angle of 45° and a depth of .030 inch or less

_____n. The process of finishing machined parts by means of a revolving abrasive wheel

_____o. Preparation process for tempering steel

Section II (Definitions continue on next page.)

_____a. A series of small diamond-shaped or straight impressions pressed into a metal surface

_____b. A circular projection on a casting

_____c. Two or more surfaces that are the same distance apart at all points

_____d. A tab designed to interlock with a second tab

_____e. A slot cut on a shaft or in the bore of a gear or pulley, into which is fitted a key

_____f. Circles lying in the same plane which partly coincide but do not have the same center

_____g. A curved inside corner formed to increase the strength of an object and improve its appearance

_____h. A spiral pattern cut into a surface for use with gears

_____i. Circles lying in the same plane with the same center

_____j. A support for a shaft or pivot

_____k. Square or circular raised surface found on castings

_____l. An angular or rounded contour often found on the face of a pulley

_____m. A rounded depression machined in a surface

1. Neck
2. Eccentric
3. Bevel
4. Fillet
5. Bore
6. Flange
7. Boss
8. Keyway
9. Knurl
10. Parallel
11. Ream
12. Pad
13. Concentric

_____n. A projecting rim used for fastening or increasing strength

_____o. Two surfaces that meet to form a 90° angle

_____p. A surface that is tapered at an angle other than a right angle to a reference surface

_____q. A hole that is usually cut by using a boring tool; the surface is usually a locating surface

2. Explain what each of the following blueprint symbols represent.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

i. _____

j. _____

k. _____

l. _____

m. _____

n. _____

3. Write the abbreviations used on blueprints for each of the following terms.

a. _____Cast steel

b. _____Square

c. _____Hexagon

d. _____Radius

e. _____Inside diameter

f. _____Full size

g. _____Cold rolled steel

h. _____Finish

i. _____Countersink

j. _____Cast iron

k. _____Counterbore

l. _____Center to center

m. _____Finish all over

n. _____On center

o. _____Diameter

p. _____Symmetrical

q. _____Not to scale

r. _____Society of Automotive Engineers

s. _____American Standard Taper Pipe

t. _____United States Standard

u. _____Total Indicator Reading

v. _____Parallel

w. _____Full Size Detail

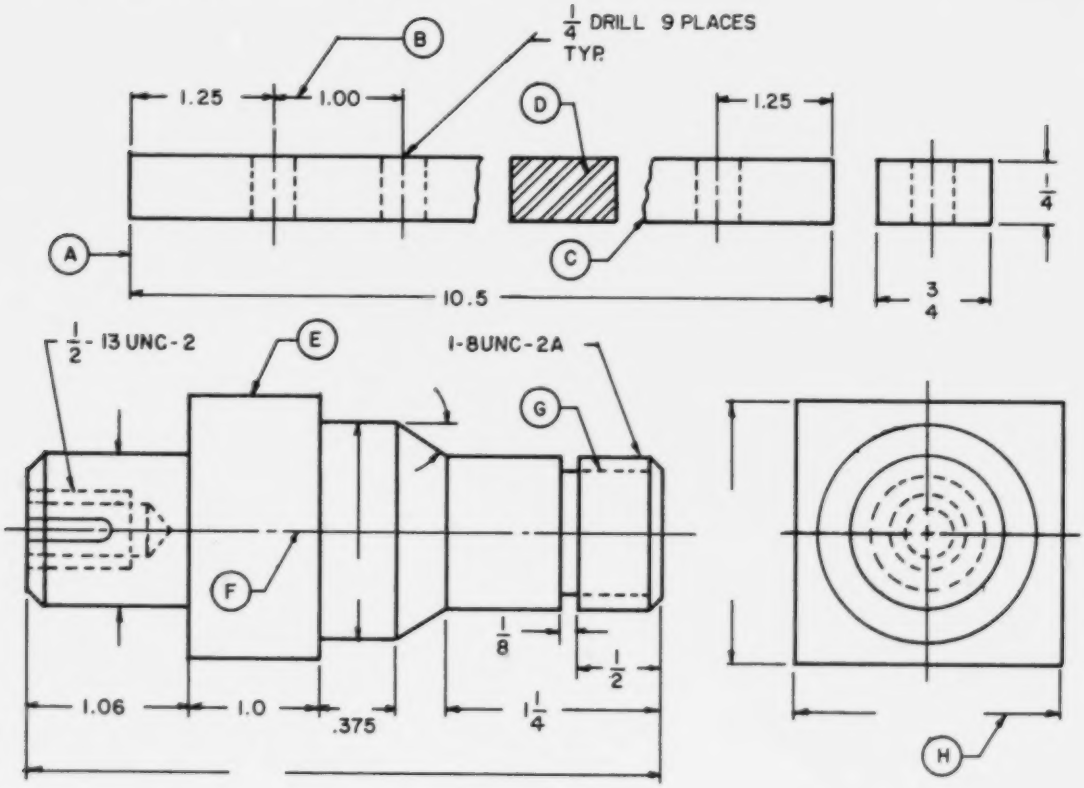
x. _____Unified National Coarse

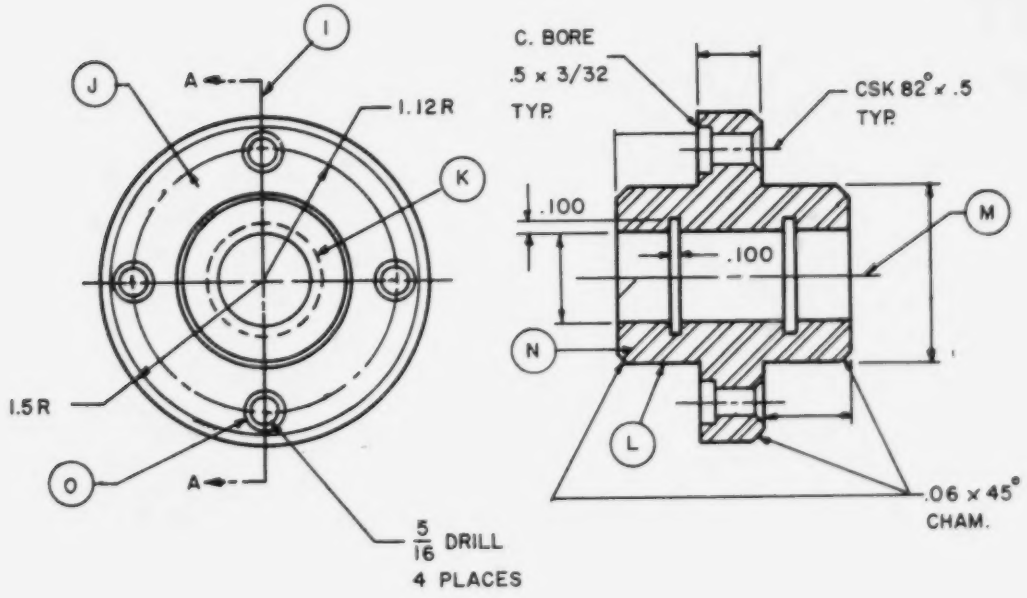
y. _____Unified National Fine

z. _____Unified National Special

aa. _____American Iron and Steel Insitute

4. Identify the lines indicated in the blueprints below. Write the type of line in the space provided by the correct letter.





a. _____ f. _____ k. _____

b. _____ g. _____ l. _____

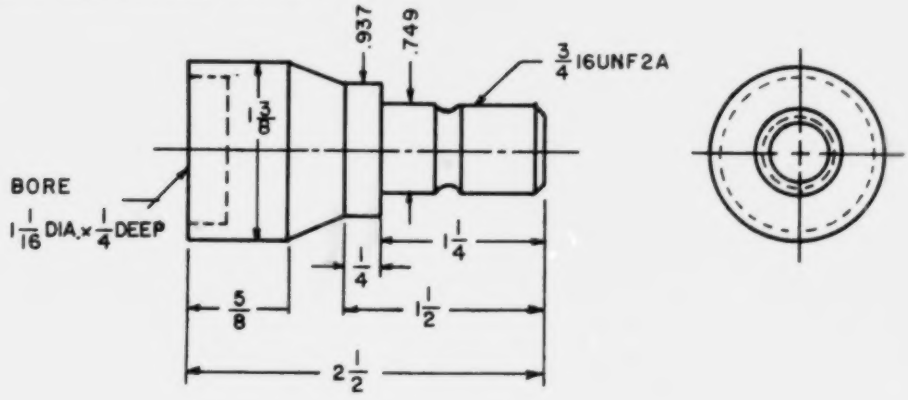
c. _____ h. _____ m. _____

d. _____ i. _____ n. _____

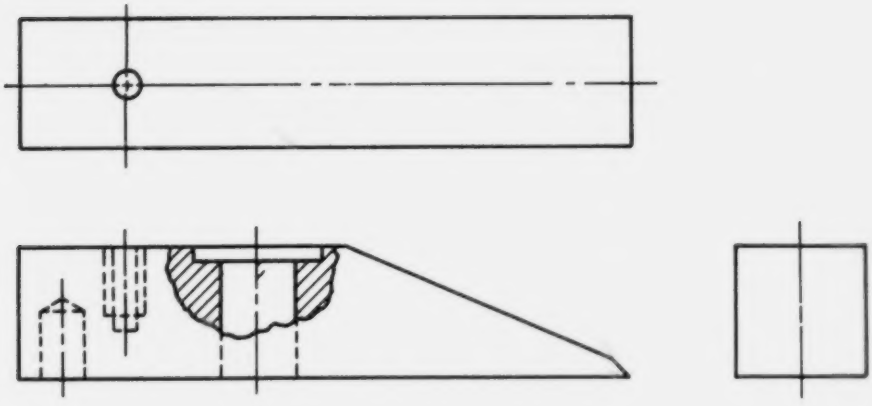
e. _____ j. _____ o. _____

5. Sketch orthographic projection drawings of the parts pictured below by completing the views or by drawing the missing view.

a. Add the missing lines.



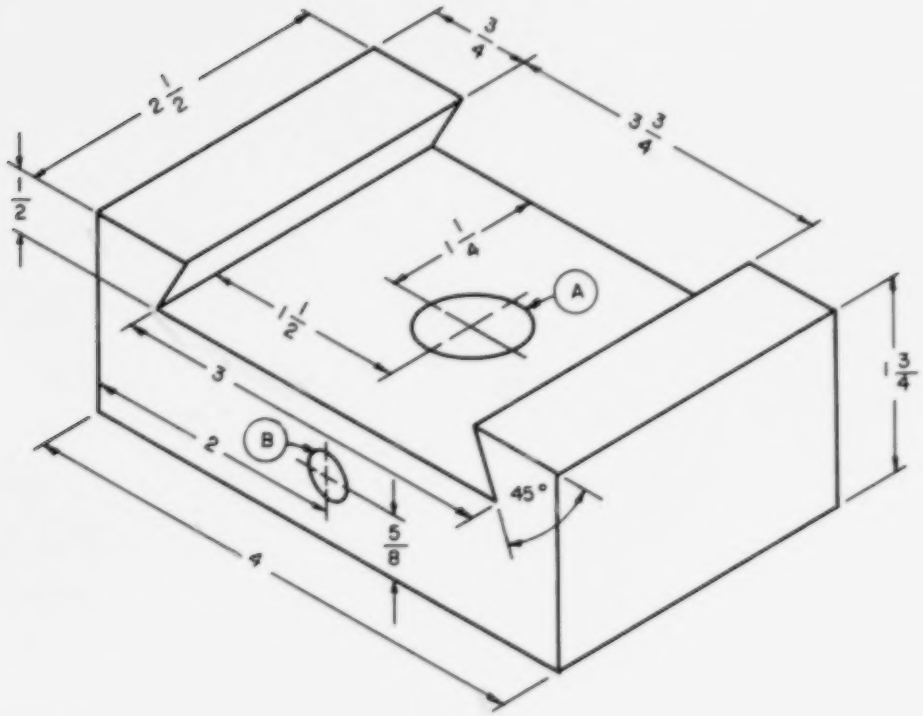
b. Complete the views below and add all missing object and hidden lines.



c. Make a three-view sketch of the part pictured below, using the space provided on the next page.

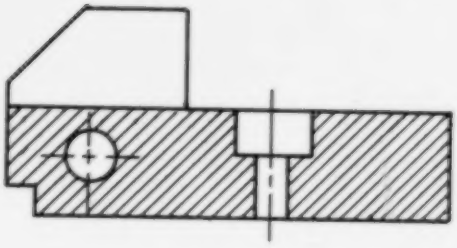
Note: (A) 3/4" dia clear through

(B) 3/8" dia 3/8" deep

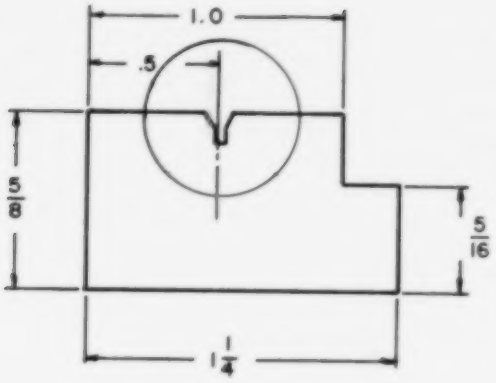


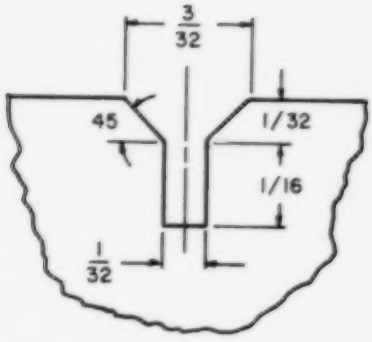
6. Label types of views shown on a blueprint. Write the correct names in the blanks provided.

a. _____

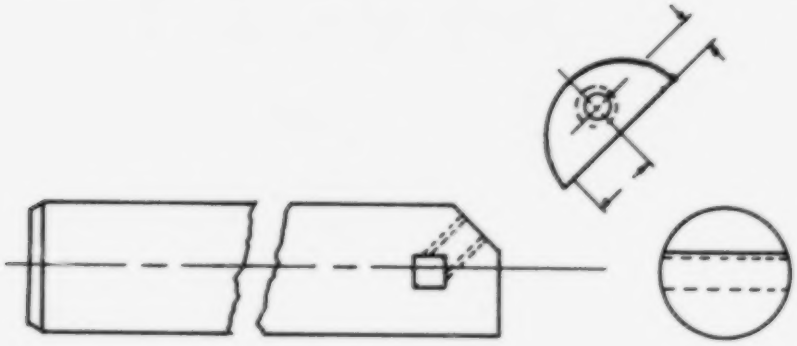


b. _____

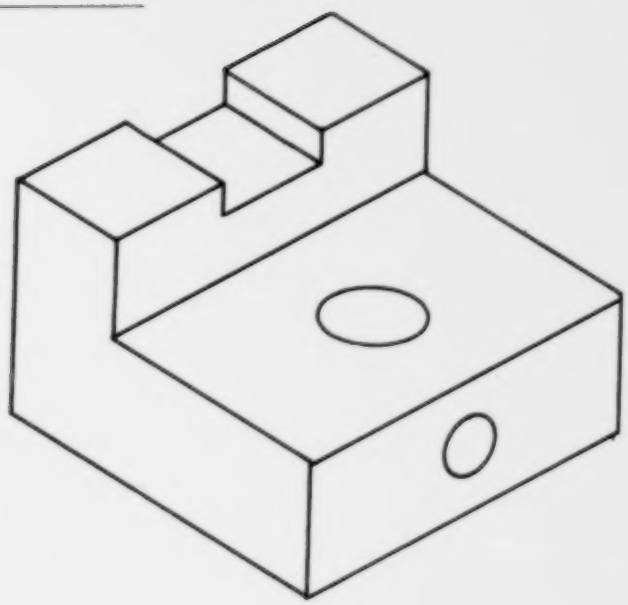




c. _____



d. _____



7. Define dimension and tolerance.

a. Dimension--_____

_____

b. Tolerance--_____

_____

8. Identify industry methods of showing dimension and tolerance. Write the correct numbers in the blanks provided.

_____a.	The size of a part before allowances and tolerances are applied	1. Datums
_____b.	The extreme permissible dimensions of a part resulting from use of tolerances	2. Linear dimensioning
_____c.	Method of referencing dimensions where accurate machining is required	3. Angular dimensioning
_____d.	Used to indicate surface finish	4. Reference dimensioning
_____e.	Refers to the measured size of a part	5. Tabular dimensioning
_____f.	Points, surfaces, or lines from which references are made; indicated by letters with dashes on each side and enclosed in a small box	6. Arrowless dimensioning
_____g.	Used to show an approximate dimension when the actual dimension is unknown because of angle cutting or machining	7. Nominal size
		8. Basic size
_____h.	Used for checking purposes; are without tolerances and not to be used for layout, machining, or inspection	9. Allowance
		10. Actual size
_____i.	Used on drawings which contain datum lines	11. Limits
_____j.	Used to indicate the size of angles in degrees, minutes, and seconds	
_____k.	Used when a series of parts is made that has the same shape, but different sizes; dimensions are replaced with letters	
_____l.	The size of a part after machining but prior to surface finishing	
_____m.	Used to designate size for a commercial product; may or may not be the true size	
_____n.	The intentional difference in the dimensioning of mating parts; provides different classes of fits	

9. Study the title block of a blueprint shown below and answer the questions which follow.

						B	WAS + .005 3/9/81		
					(I)	A	WAS 1.25 5/1/81		
			DO NOT SCALE DRAWING			SYM	REVISION Date	BY	APPD.
		HEAT TREATMENT NONE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS		DRAWN		2/81	CURR INC. STILLWATER, OK	
		FINISH			CH' KD		2/81		
D-245	24572	NONE	(H)		(G) APPD.		2/81		
D-245	24572	QTY.REG.	.X ± .06 .XX ± .03 .XXX ± .010		CODE IDENT. NO.			NAME SAMPLE (C)	
NEXT ASSY	USED ON	ONE EACH	ANGLES ± .0° 30'		12120 (F)				
APPLICATION		FILE NUMBER (B)	MATERIAL		SCALE		SIZE (E)	DRAWING NO. (A)	SHEET (D)
		B-2C72	4140		FULL		D	B-24572	2-6

a. How many total sheets are there in the blueprints for this project? _____

b. Who checked the drawing? _____

c. On May 1, 1981, one of the dimensions was changed to 1.30. What was the dimension before the change? _____

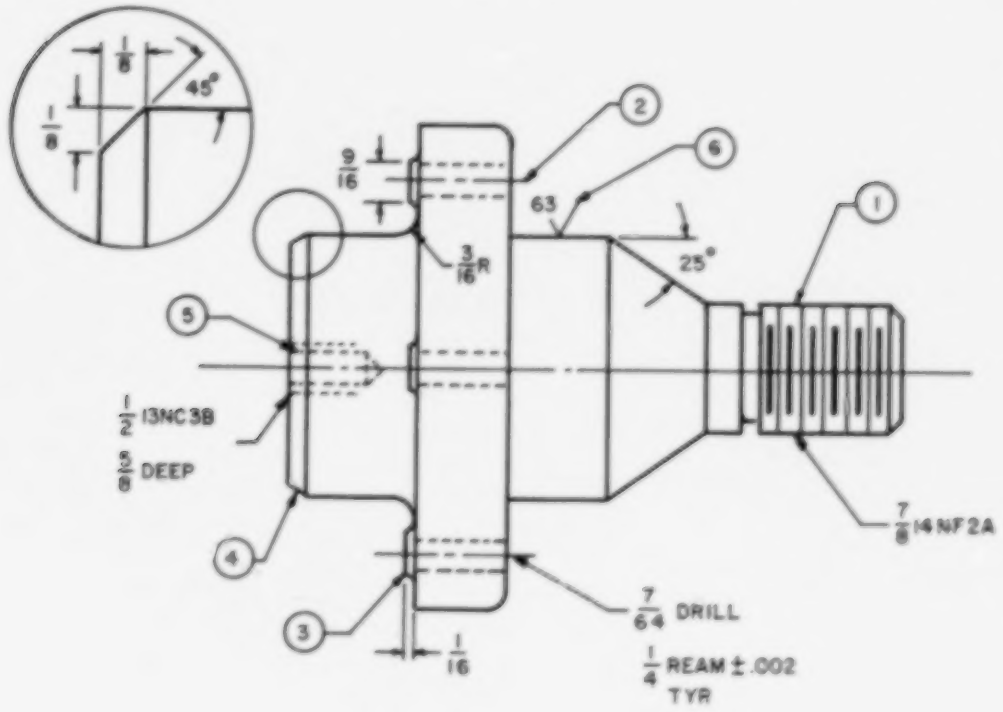
d. What is the size ratio between the actual part and drawing on the blueprint? _____

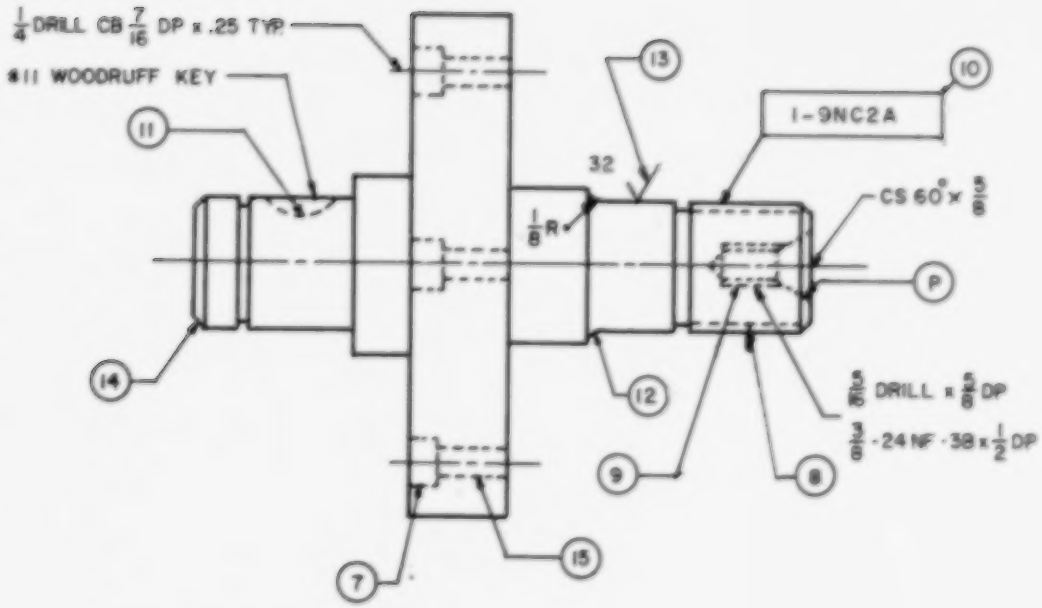
e. One of the dimensions on the part is 2.85." What is the maximum allowable length on this dimension? _____

f. Who approved the change made on March 9, 1981? _____

g. Under what number is this drawing filed? _____

10. Interpret machine specifications on the two drawings shown. Answer the questions which follow on the next page.





a. What is represented by number 1?_____

b. What is represented by number 2 and what is its size?_____

_____

c. What is represented by number 3?_____

d. State the size and process represented by number 4._____

e. What does number 6 represent?_____

f. What are the process and specifications represented by number 7?_____

_____

g. What is represented by number 8?_____

h. What is represented by number 9?_____

i. What are the specifications for 10?_____

_____

j. What are the specifications and process indicated by number 11?_____

_____

k. What are the specifications and process indicated at 12?_____

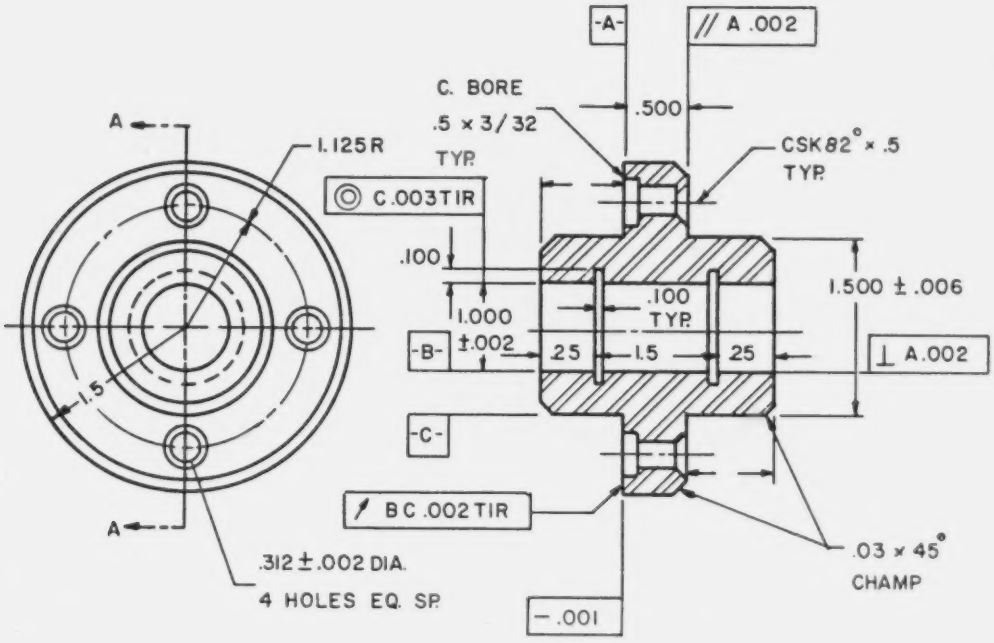
_____

l. What is the specification represented by number 13?_____

m. What is the process indicated at 14?_____

n. What is indicated by number 15?_____

11. Read the industrial blueprints shown below and on the next page. Answer the questions that follow.



a. What is the depth of the counterbored holes? _____

b. What is the diameter of the bolt hole circle? _____

c. What does ⊥ A.002 imply? _____

d. What is the tolerance of the 1" hole? Max. _____ Min. _____

e. What does //A.002 imply? _____

f. How flat and straight must -A- be? _____

g. What is the meaning of ◎ C.003TIR ? _____

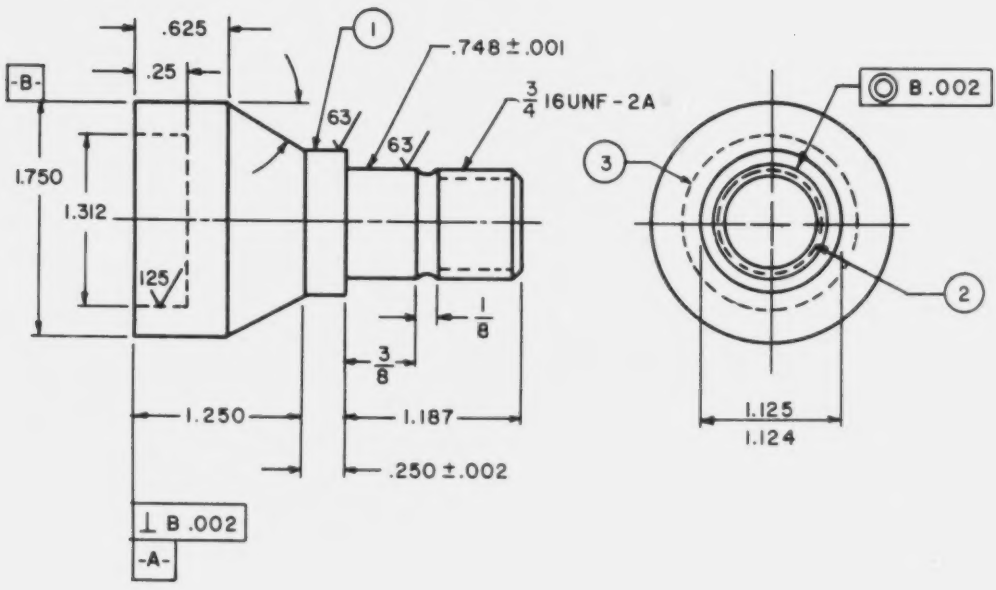
h. What is the size of the chamfers? _____

i. How much runout from datum -A- is allowed for datums -B- and -C- ?

_____

j. What is the permitted variation in diameter of the equally spaced holes?

_____



k. What is the tolerance of 1? _____

l. What does 2 represent? _____

m. What is the finish of the bore? _____

n. What is the overall length of the part? _____

o. What does 3/4 16UNF-2A mean? _____

_____

p. What does ◎ B.002 indicate? _____

q. What does 3 indicate? _____

r. What is the diameter of -B- ? _____

s. Is the part machined on all surfaces? _____

t. What is the perpendicular tolerance of -A- to -B- ? _____

12. Stop. Have your instructor evaluate your test and mark the areas below which require additional study.

    a. Refer to Informations Sheet, Sections:

_____ I	_____ VI
_____ II	_____ VII
_____ III	_____ VIII
_____ IV	_____ IX
_____ V	_____ X

    b. _____ Read Industrial Blueprints.

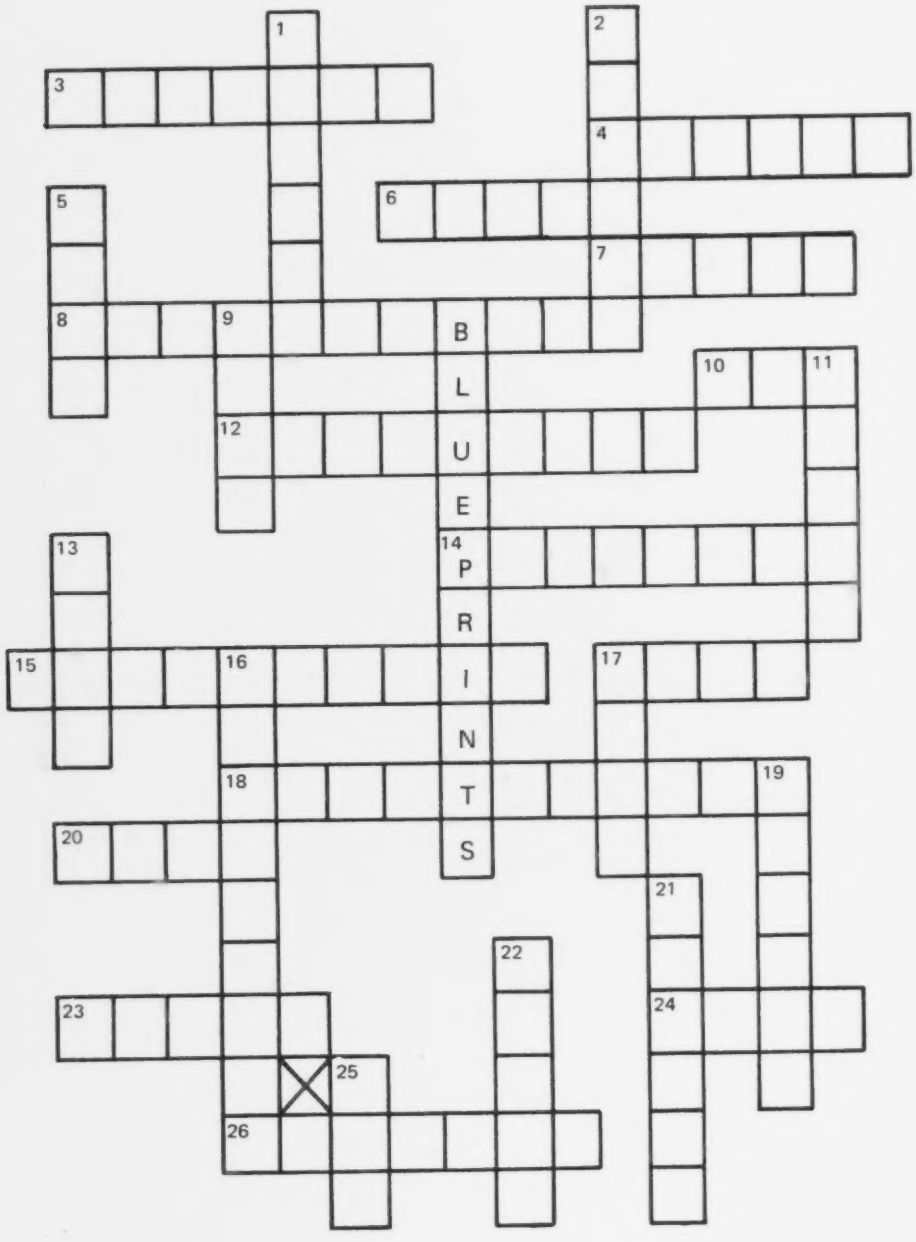
You came here from LAP Step 2. If none of the items listed in (a) or (b) above is checked, continue to the next assigned Learning Activity Packet. If any of the Sections in (a) is checked, continue to LAP Step 3. If only (b) is indicated for additional study, review blueprint reading with your instructor and then proceed to LAP Step 40.

BLUEPRINTS
UNIT II

LAP ASSIGNMENT SHEET #1--BLUEPRINT TERMS AND DEFINITIONS

NAME _____ SCORE _____

1. Match terms associated with blueprints to their correct definitions by completing the crossword puzzle below.



Across

3. A support for a shaft or pivot

4. The process of heating a metal piece to a high temperature to soften it, and allowing it to cool slowly

6. An angular or rounded contour often found on the face of a pulley

7. The process of finishing machined parts by means of a revolving abrasive wheel

8. The process of enlarging a portion of a hole to a specific diameter and depth, usually greater than .030 inch

10. Square or circular raised surface found on castings

12. Preparation process for tempering steel

14. Two or more surfaces that are the same distance apart at all points

15. Circles lying in the same plane with the same center

17. A hole that is usually cut by using a boring tool; the surface is usually a locating surface

18. The process of tapering the top of a hole at a specific angle

20. The process of hardening the outer surface of a steel part, forming a hard case on the metal while leaving the inner metal soft

    (NOTE: This term is two words; the second word is 21 Down.)

23. A series of small diamond-shaped or straight impressions pressed into a metal surface

24. The process of finishing a drilled hole to an accurate size

26. To remove a sharp external edge with a cutting tool, usually at an angle of 45° and a depth of .030 inch or less

Down

1. A curved inside corner formed to increase the strength of an object and improve its appearance

2. A projecting rim used for fastening or increasing strength

5. The process of making a flat surface perpendicular to a specific diameter and depth usually less than .030 inch

   (NOTE: This term is two words; the first word is 13 Down.)

9. The process of cutting a relief in a diameter near a shoulder

11. The process of originating a hole by using a drill

13. First word (See 5 Down)

16. Circles lying in the same plane which partly coincide but do not have the same center

17. A circular projection on a casting

19. A slot cut on a shaft or in a bore of a gear or pulley, into which is fitted a key

21. Second word (See 20 Across)

22. A surface that is tapered at an angle other than a right angle to a reference surface

25. The process of lapping finished parts to very close tolerances, leaving the surface very smooth

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to LAP Step 7. Otherwise, study Section I of the Information Sheet and then go to LAP Step 6.

BLUEPRINTS
UNIT II

LAP ASSIGNMENT SHEET #2--BLUEPRINTS TERMS AND DEFINITIONS

NAME _____ SCORE _____

1. Define the following terms.

a. Anneal--_____

_____

b. Bearing--_____

_____

c. Bevel--_____

_____

d. Bore--_____

_____

e. Boss--_____

_____

f. Carburize--_____

_____

g. Case harden--_____

_____

h. Chamfer--_____

_____

i. Counterbore--_____

_____

j. Countersink--_____

_____

k. Crown--_____

_____

l. Drill--_____

_____

m. Concentric--_____

_____

n. Eccentric--_____

_____

o. Fillet--_____

_____

p. Flange--_____

_____

q. Grind--_____

_____

r. Keyway--_____

_____

s. Pad--_____

_____

t. Knurl--_____

_____

u. Lap--_____

_____

v. Neck--_____

_____

w. Parallel--_____

_____

x. Ream--_____

_____

y. Spot face--_____

_____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 7. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 7.

BLUEPRINTS
UNIT II

LAP ASSITNMENT SHEET #3--BLUEPRINT SYMBOLS

NAME _____ SCORE _____

1. Explain what each of the following blueprint symbols means.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

i. _____

j. _____

k. _____

l. _____

m. _____

n. _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 11. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 11.

BLUEPRINTS
UNIT II

LAP ASSIGNMENT SHEET #4--BLUEPRINT ABBREVIATIONS

NAME _____ SCORE _____

1. Write the abbreviation which might appear on a blueprint for each of the following.

   a. Parallel--_____

   b. Symmetrical--_____

   c. Number--_____

   d. American Standard Taper Pipe--_____

   e. Total indicator reading--_____

   f. Diameter--_____

   g. Finish--_____

   h. United States Standard--_____

   i. Inside diameter--_____

   j. Square--_____

   k. Center to center--_____

   l. Unified National Coarse--_____

   m. Cast iron--_____

   n. Full size--_____

   o. Typical--_____

   p. Radius--_____

   q. Cold rolled steel--_____

   r. American Iron and Steel Institute--_____

   s. Required--_____

   t. Countersink--_____

   u. Hexagon--_____

   v. Finish all over--_____

w. Counterbore--_____

x. Society of Automotive Engineers--_____

y. Pitch diameter--_____

z. Outside diameter--_____

aa. Cast steel--_____

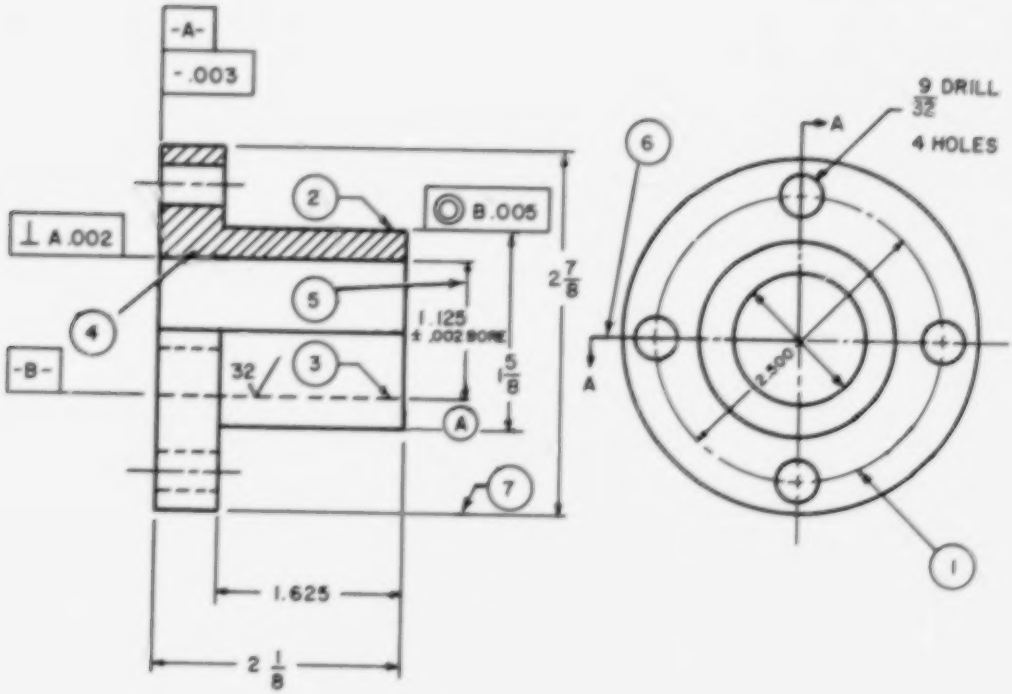
2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 15. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 15.

BLUEPRINTS
UNIT II

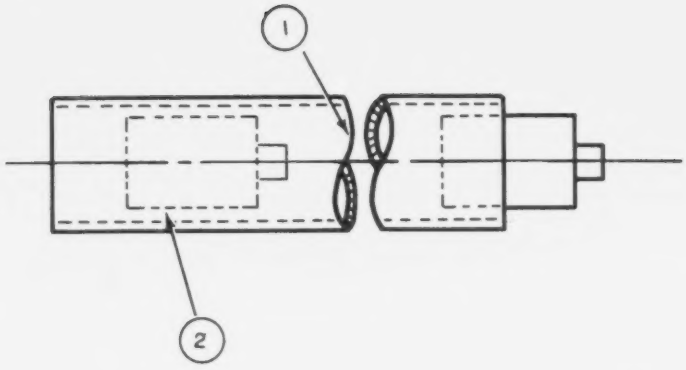
LAP ASSIGNMENT SHEET #5--IDENTIFY LINES ON BLUEPRINTS

NAME _____ SCORE _____

1. Identify the blueprint lines indicated by the numbered arrows.



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____



1. _____

2. _____

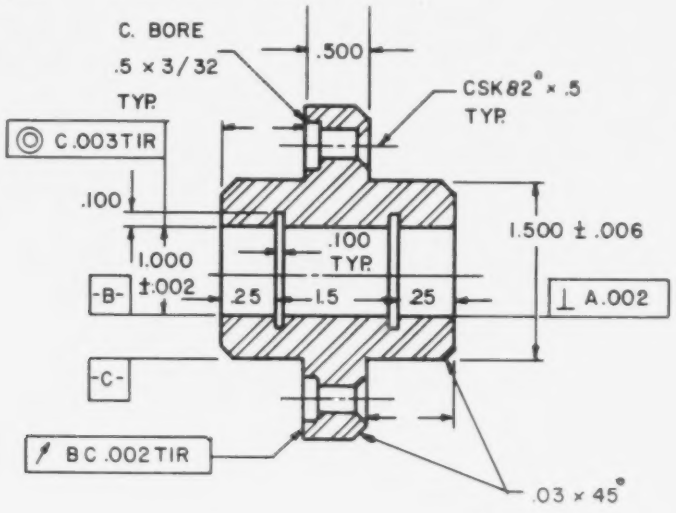
2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 19. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 19.

BLUEPRINTS
UNIT II

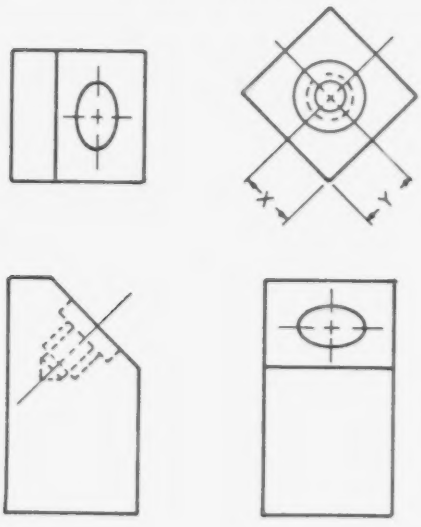
LAP ASSIGNMENT SHEET #6--OTHER BLUEPRINT VIEWS

NAME _____ SCORE _____

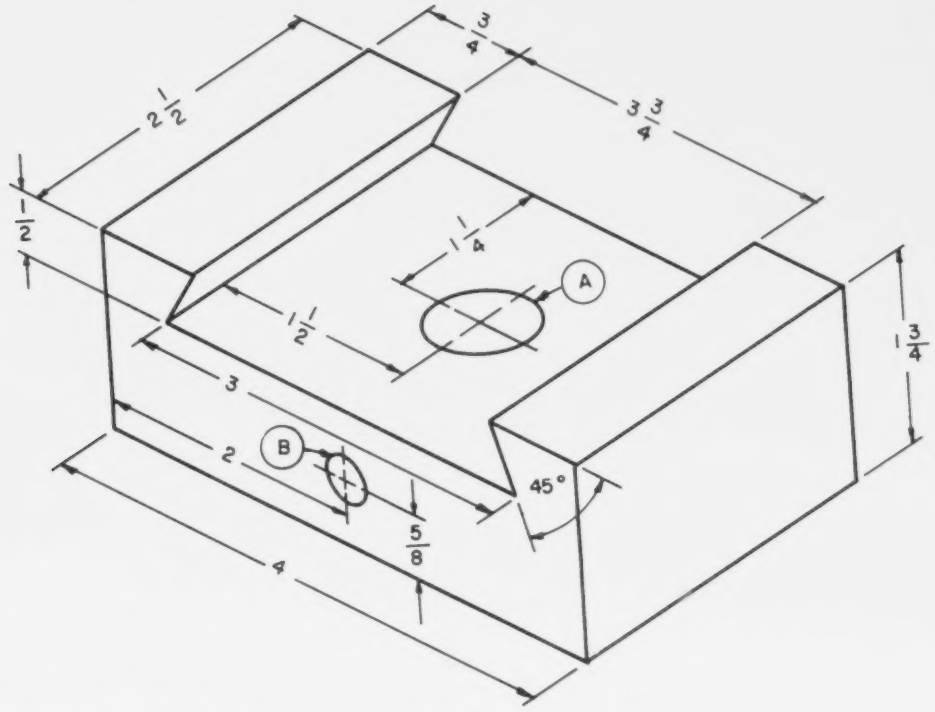
1. Identify the types of blueprint views shown.



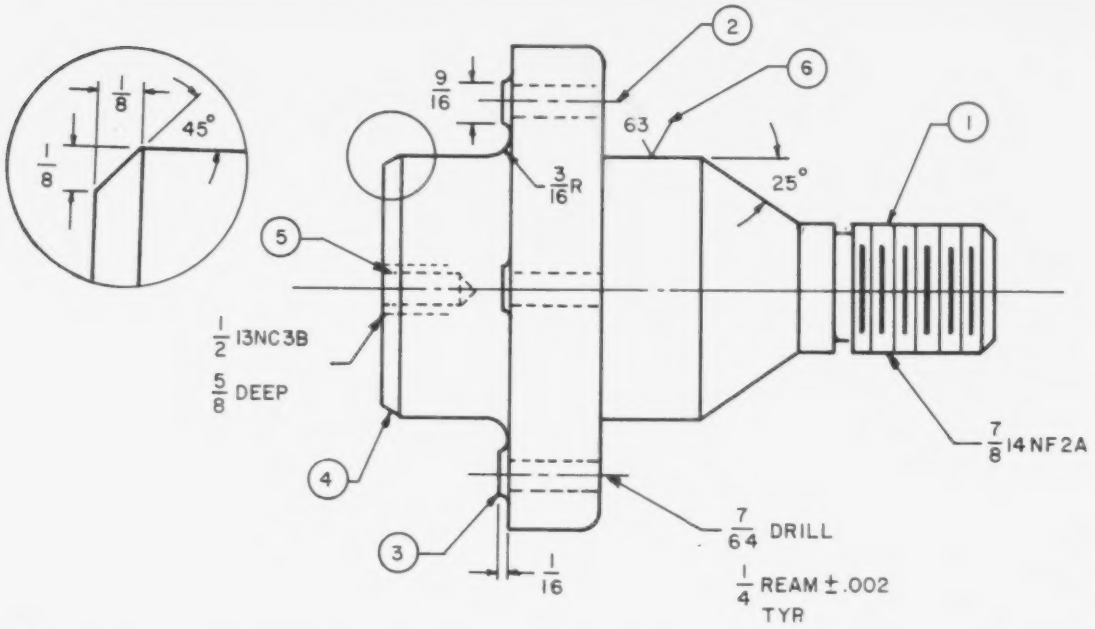
a. _____



b. _____



c. _____



d. _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 28. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 28.

BLUEPRINTS
UNIT II

LAP ASSIGNMENT SHEET #7--DIMENSION AND TOLERANCE

NAME _____ SCORE _____

1. Define dimension and tolerance by completing the statements below.

   a. Dimension--Tells the _____, _____, and _____ of holes and slots

   b. Tolerance--The total _____ permitted in the size of a part

2. Identify industry methods of showing dimension by unscrambling the letters for the correct term.

   a. S M U D A T

      _____--Points, surfaces, or lines from which references are made; indicated by letters with dashes on each side and enclosed in a small box

   b. N A I L E R

      _____ dimensioning--Method of referencing dimensions where accurate machining is required

   c. G R A N U A L

      _____ dimensions--Used to indicate the size of angles in degrees, minutes, and seconds

   d. C R E E N F R E E

      _____ dimensions--Used for checking purposes; are without tolerances and not to be used for layout, machining, or inspection

   e. A T R U B L A

      _____ dimensions--Used when a series of parts is made that have the same shape, but different sizes; dimensions are replaced with letters

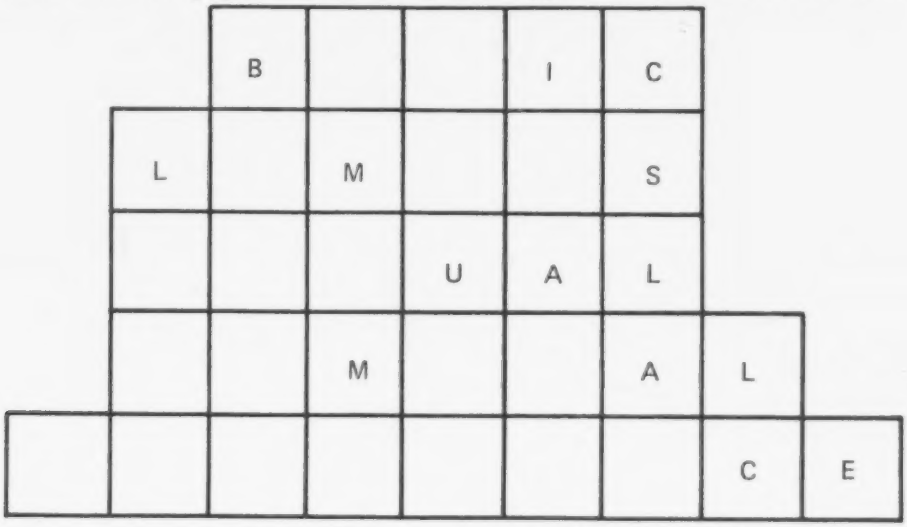
   f. S L O W R E A R S

      _____ dimensioning--Used on drawings which contain datum lines

3. Identify industry methods of showing dimension. When a customer saw a large snake being carried into a night club, he asked the night club owner if the snake was going to be cooked. The owner replied:

"No, I allow it in as an act."

Use the owner's answer to fill in the missing letters in the following matrix. This will help you to identify the types of tolerances listed below.



a. _____ size--The size of a part before allowances and tolerances are applied.

b. _____ --The extreme permissible dimensions of a part resulting from use of tolerances.

c. _____ size--Refers to the measured size of a part.

d. _____ size--Used to designate size for a commercial product; may or may not be the true size.

e. _____ --The intentional difference in the dimensioning of mating parts; provides different classes of fits.

4. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, proceed to LAP Step 31. Otherwise, continue to LAP Step 30.

BLUEPRINTS
UNIT II

LAP ASSIGNMENT #8--DIMENSION AND TOLERANCE

NAME _____ SCORE _____

1. Define the following terms associated with dimension and tolerance.

   a. Dimension--_____

   _____

   b. Tolerance--_____

   _____

   c. Linear dimensioning--_____

   _____

   d. Basic size--_____

   _____

   e. Datums--_____

   _____

   f. Allowance--_____

   _____

   g. Actual size--_____

   _____

   h. Arrowless dimensioning--_____

   _____

   i. Tabular dimensions--_____

   _____

   j. Nominal size--_____

   _____

   k. Angular dimensions--_____

   _____

l. Limits--_____

_____

m. Reference dimensions--_____

_____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 31. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 31.

BLUEPRINTS
UNIT II

LAP ASSIGNMENT SHEET #9--BLUEPRINT TITLE BLOCKS

NAME _____ SCORE _____

1. Study the title block below and answer the questions which follow.

				A	WAS 1.25 6/16/82	Bell	Bud	
			DO NOT SCALE DRAWING	SYM	REVISION Date	BY	APPD.	
		HEAT TREATMENT NONE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS	DRAWN Jim	2/81	CURR INC. STILLWATER, OK		
		FINISH		CH' KD Joyce	2/81			
D-245	24572	NONE		APPD. Bud	2/81			
D-245	24572	QTY.REG.	.X ± .06 .XX ± .03 .XXX ± .010 ANGLES ± .0° 30'	CODE IDENT. NO. 12120		NAME Slide Brace		
NEXT ASSY	USED ON	ONE EACH						
APPLICATION		FILE NUMBER B-2C72	MATERIAL 4140	SCALE Half	SIZE D	DRAWING NO. B-24572		SHEET 2-6

a. What part is shown on the blueprint? _____

b. How many sheets are there in the blueprint for this part? _____

c. If a dimension of the actual part is 1 5/16", how long is the line representing that dimension on the drawing? _____

d. What revision was made on June 16, 1982? _____

e. Who approved the June 16, 1982, revision? _____

f. Who approved the drawing? _____

g. What are the maximum and minimum limits of a dimension specified to be 1.075? Maximum _____; Minimum _____.

h. What information would you enter in the title block if you changed a 1.125" dimension on the drawing to 1.130" on today's date? _____

_____

i. What is the original date of the drawing? _____

j. Who drew the original blueprint? _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 35. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 35.

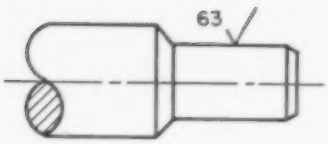
BLUEPRINTS
UNIT II

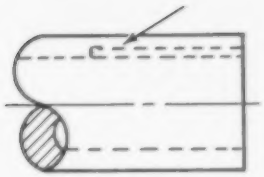
LAP ASSIGNMENT SHEET #10--SPECIFICATIONS AND PROCESSES

NAME _____ SCORE _____

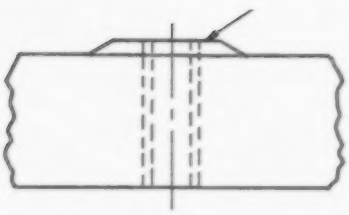
1. Identify the following machining specifications and processes as represented on blueprints.

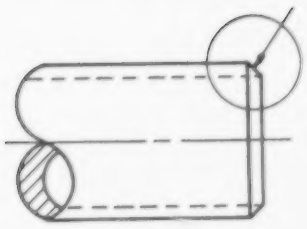
a. _____ b. _____



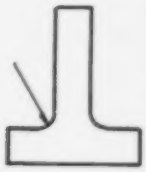


c. _____ d. _____

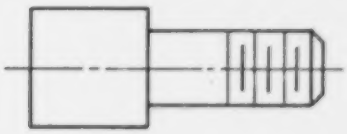




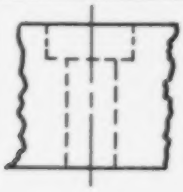
e. _____



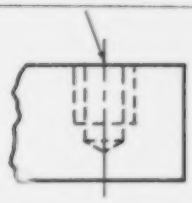
f. _____



g. _____

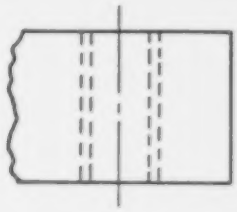


h. _____

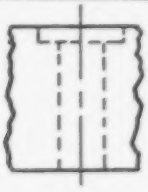


i. _____

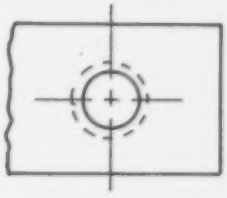
j. _____



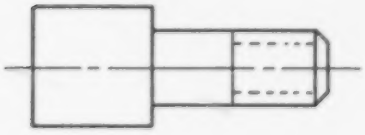
k. _____



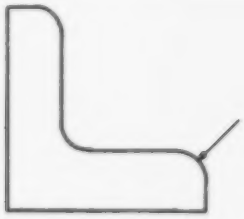
l. _____



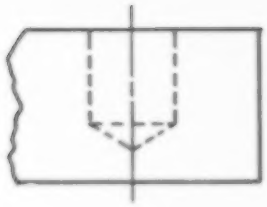
m. _____



n. _____



o. _____



p. _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your performance, continue to LAP Step 39. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 39.

State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for MACHINE SHOP I

LAP NO._____ CODE:_____

MAJOR INSTRUCTIONAL AREA

BASIC AND RELATED TECHNOLOGY

INSTRUCTIONAL UNIT

RULES
SECTION B--UNIT III

LEARNING ACTIVITY PACKET NO.

5

PREREQUISITE LAP(S)

1, 3

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities and performance tasks for "Rules." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training and in achieving a SKILLED or MODERATELY SKILLED competency level in the performance of jobs associated with this specialty.

INTRODUCTION: The course of study in this LAP will help the student become able to name the basic units of measurement and to read and use the common types of linear measuring tools.

TASKS INCLUDED IN THIS LAP:

1. Use steel rule.
2. Use hook rule.
3. Use steel rule to set caliper and divider.
4. Use combination set.

MACHINE SHOP I
RULES
SECTION B--UNIT III

LEARNING STEPS

Check the Following
Blanks as You Complete
the Required Steps

_____1. Read Unit and Specific Objectives, page 169-B.

_____2. Complete Rules Pre-Test, LAP page 7.

_____3. Study The sections of the Information Sheet, pages 171-B through 196-B, indicated by your instructor on your Pre-Test. Be sure to refer to the transparency masters when required.

_____4. Refer To Step 8 of your Pre-Test. If additional study is indicated for any of Sections I, II, III, or IV, continue to Step 5. Otherwise, proceed to Step 7.

_____5. Do LAP Assignment Sheet #1, LAP page 17.

_____6. Do LAP Assignment Sheet #2, LAP page 27.

_____7. Refer To Step 8 of your Pre-Test. If additional study is indicated for Section V, continue to Step 8. Otherwise, proceed to Step 11.

_____8. Do Assignment Sheet #1--Construct Straight Lines Using Steel Rule, page 197-B.

_____9. Stop. Have your instructor evaluate Assignment Sheet #1. If your instructor is satisfied with your performance, proceed to Step 11. Otherwise, continue to Step 10.

_____10. Do LAP Assignment Sheet #3, LAP page 33.

_____11. Refer To Step 8 of your Pre-Test. If additional study is indicated for "Measure Length of Lines," continue to Step 12. Otherwise, proceed to Step 15.

_____12. Do Assignment Sheet #2--Use Steel Rules to Measure Length of Lines, page 199-B.

_____13. Stop. Have your instructor evaluate Assignment Sheet #2. If your instructor is satisfied with your performance, proceed to Step 15. Otherwise continue to Step 14.

_____14. Do LAP Assignment Sheet #4, LAP page 35.

_____15. Check The tasks below which you feel that you can perform without supervision.

Student Check		Instructor Initials/Date	
		Skilled	Moderately Skilled
_____a.	Use steel rule (18).	_____	_____
_____b.	Use hook rule (24).	_____	_____
_____c.	Use steel rule to set caliper and divider (30).	_____	_____
_____d.	Use combination set (36).	_____	_____

_____16. Discuss Your competency in each task with your instructor. Your instructor will initial each task in which you demonstrate sufficient competency. If all tasks have been initialed, proceed to Step 42. Otherwise, continue to Step 17.

_____17. Refer — To Step 15a. If this task has been initialed, proceed to Step 23. Otherwise, continue to Step 18.

_____18. Study — Job Sheet #1--Use Steel Rule, page 201-B.

_____19. Watch — Slide/Tape presentation "Use Steel Rule" (B-I-1).

_____20. Do — Job Sheet #1--Use Steel Rule.

_____21. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15a and proceed to Step 23. Otherwise, repeat Steps 18-20 and then go to Step 21.

_____22. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15a and continue to Step 23. If additional study is required, discuss a program to help you attain sufficient competency with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Step 23.

_____23. Refer — To Step 15b. If this task has been initialed, proceed to Step 29. Otherwise, continue to Step 24.

_____24. Study — Job Sheet #2--Use Hook Rule, page 205-B.

_____25. Watch — Slide/Tape presentation "Use Hook Rule" (B-III-2).

_____26. Do — Job Sheet #2--Use Hook Rule.

_____27. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, having your instructor initial Step 15b and proceed to Step 29.
Otherwise repeat Steps 24-26 and then go to Step 28.

_____28. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15b and continue to Step 29. If additional study is required, discuss a program to help you attain sufficient competency with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 15b and continue to Step 29.

_____29. Refer To Step 15c. If this task has been initialed, proceed to Step 35. Otherwise, continue to Step 30.

_____30. Study Job Sheet #3--Use Steel Rule to Set Caliper and Divider, page 209-B.

_____31. Watch Slide/Tape presentation "Use Steel Rule to Set Caliper and Divider" (B-III-3).

_____32. Do Job Sheet #3--Use Steel Rule to Set Caliper and Divider.

_____33. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15c and proceed to Step 35. Otherwise, repeat Steps 30-32, and then go to Step 34.

_____34. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15c and continue to Step 35. If additional study is required, discuss a program to help you attain sufficient competency with your instructor. Once you have completed that program to your instructor's satsifaction, have your instructor initial Step 15c and continue to Step 35.

_____35. Refer To Step 15d. If this task has been initialed, proceed to Step 41. Otherwise, continue to Step 36.

_____36. Study Job Sheet #4--Use Combination Set, page 213-B.

_____37. Watch — Slide/Tape presentation "Use Combination Set" (B-III-4).

_____38. Do — Job Sheet #4--Use Combination Set.

_____39. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15d and proceed to Step 41. Otherwise, repeat Steps 36-38 and then go to Step 40.

_____40. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15d and continue to Step 41. If additional study is required, discuss a program to attain sufficient competency with your nstructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 15d and continue to Step 41.

_____41. Refer — To Step 15. If all tasks have been initialed, continue to Step 42. Otherwise, refer to the step indicated in parentheses after the unsigned task.

_____42. Review — Information Sheet (page 171-B) and Assignment Sheets 1-3.

_____43. Take — Rules Unit III Test (see your instructor). If your score is 85 percent or above, continue to the next Learning Activity Packet. If you do not score 85 percent or above, ask your instructor about additional study requirements and possible re-testing.

RULES
UNIT III
PRE-TEST

NAME_____ SCORE_____

DIRECTIONS: This test is to determine how much you already know about rules. Your performance on this test will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you know the answer. Guessing may prevent you from receiving the lessons which are required.

1. Match terms associated with linear measurement to the correct definitions. Write the correct numbers in the blanks provided.

_____a.	A mistake in the reading or total measurement.	1.	Steel rule
		2.	Graduations
_____b.	The starting point of measurement for both workpiece and rule.	3.	Error
_____c.	Markings found on rules; denote units length	4.	Reliable measurement
_____d.	An accurate or true measurement	5.	Reference point
_____e.	Non-precision measuring instrument graduated in fraction, decimal, or metric parts of units.		

2. Name the basic units of measurement found on steel rules.

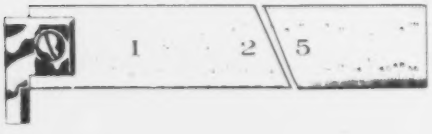
a. _____

b. _____

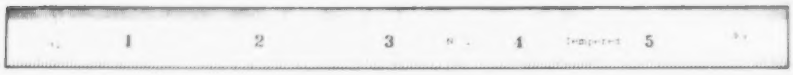
c. _____

3. Identify types of steel rules used in shop work from the illustrations shown below and on the next page. Write the correct names in the blanks provided.

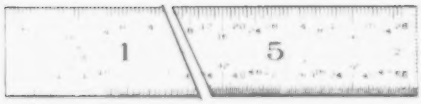
Steel rule
Hook rule
Short rule with holder
Narrow flexible rule
Slide caliper rule



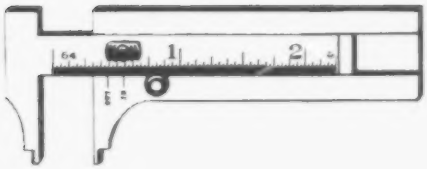
a. _____



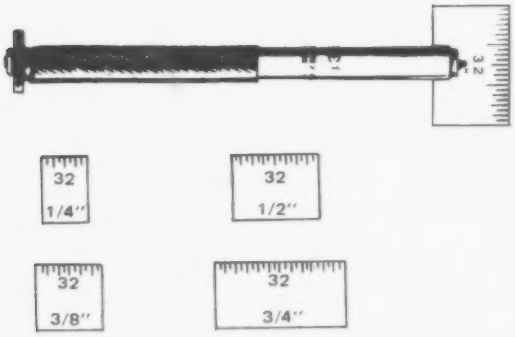
b. _____



c. _____



d. _____

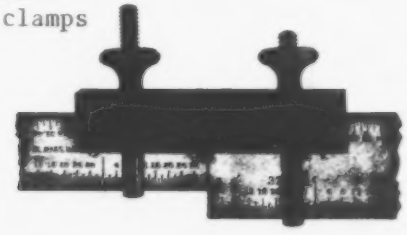


e. _____

4. Identify accessories used with steel rules as shown in the following illustrations by writing the correct name in the space provided.

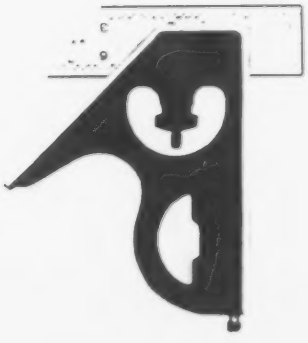
Key seat clamps
Inside caliper
Outside caliper
Divider
Rule clamps

Hook rule with drill point gage
Center head
Protractor head
Square head
Depth gage

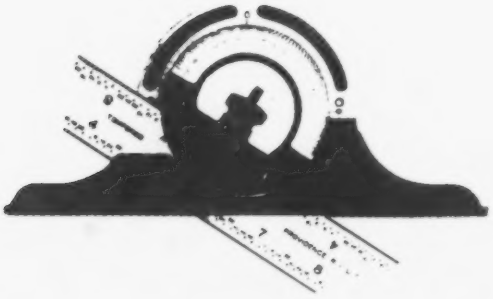


a. _____

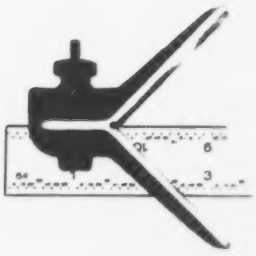
b. _____



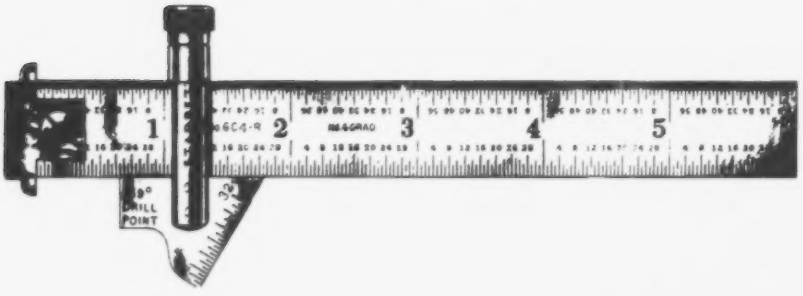
c. _____



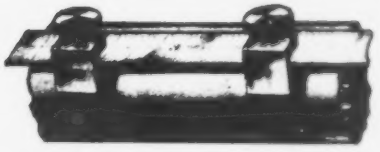
d. _____



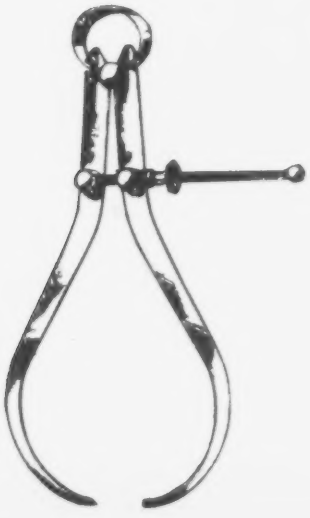
e. _____



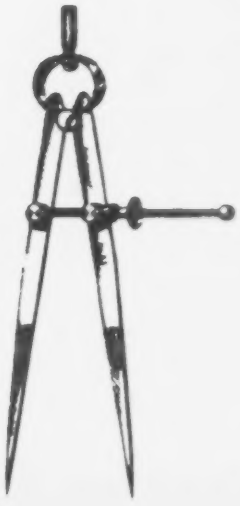
f. _____



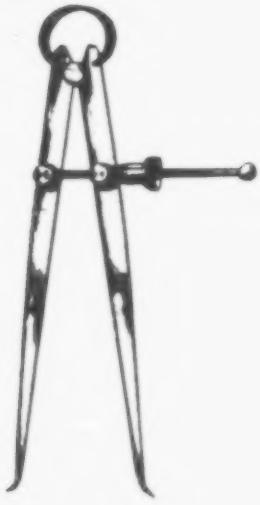
g. _____



h. _____

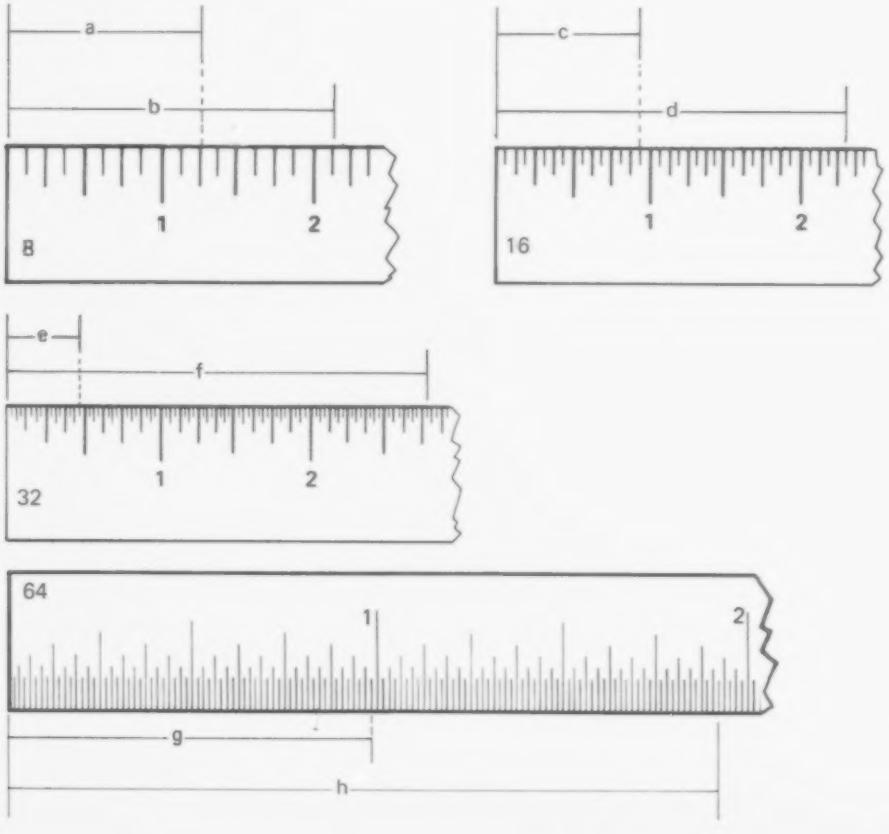


i. _____



j. _____

5. Read the steel rules shown below and write the correct measurement in its simplest form in the blanks provided.



a. _____

b. _____

c. _____

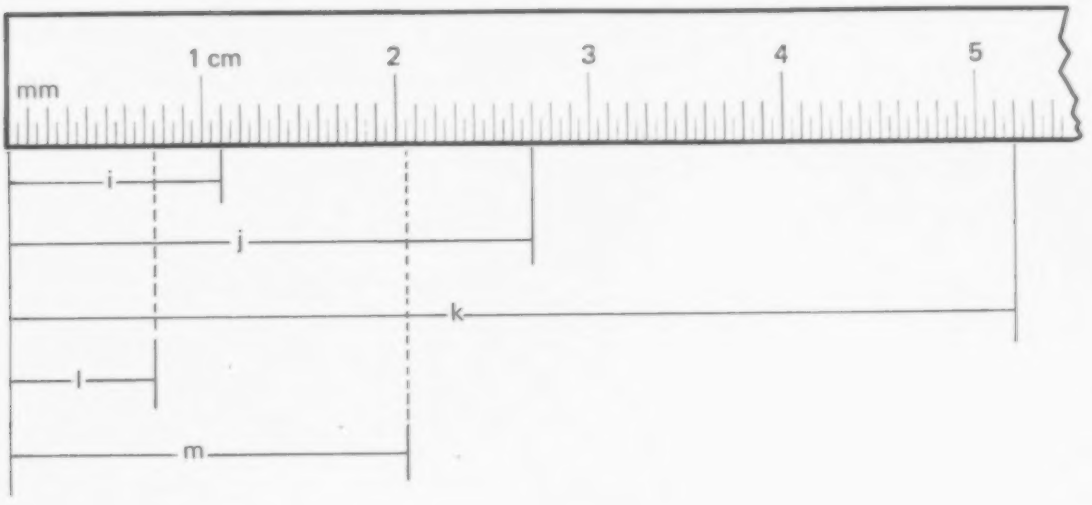
d. _____

e. _____

f. _____

g. _____

h. _____



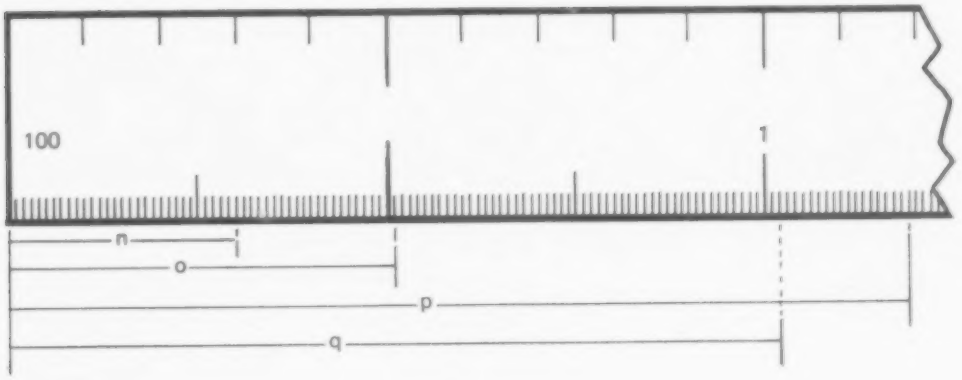
i. _____

j. _____

k. _____

l. _____

m. _____



n. _____

o. _____

p. _____

q. _____

6. Use a steel rule to draw straight lines of the following lengths in the space provided.

   a. 2 1/4 inches

   b. 3 3/4 inches

c. 4 1/2 inches

d. 1 1/8 inches

e. 2 5/8 inches

f. 4 3/8 inches

g. 2 1/16 inches

h. 4 5/16 inches

i. 3 15/16 inches

j. 1 19/32 inches

k. 2 1/64 inches

l. 1 9/64 inches

m. 3 3/64 inches

n. 4 47/64 inches

o. 4 31/32 inches

7. Use a steel rule to measure the lines below. Write your answer in its simplest terms on the line.

a. Measure these lines to the nearest quarter of an inch.

1. _____

2. _____

3. _____

4. _____

b. Measure these lines to the nearest eighth of an inch.

1. _____

2. _____

3. _____

4. _____

c. Measure these lines to the nearest sixteenth of an inch.

1.

2.

3.

4.

d. Measure these lines to the nearest thirty-second of an inch.

1.

2.

3.

4.

e. Measure these lines to the nearest sixty-fourth of an inch.

1.

2.

3.

4.

f. Measure these lines to the nearest centimeter.

1.

2.

3.

4.

g. Measure these lines to the nearest millimeter.

1.

2.

3.

4.

8. Stop. Have your instructor evaluate your Pre-Test and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I_____ V_____

II_____ VI_____

III_____ VII_____

IV_____

If any of the above study areas is checked, continue to LAP Step 3. Otherwise, proceed to LAP Step 15.

BASIC AND RELATED TECHNOLOGY
UNIT III

LAP ASSIGNMENT SHEET #1--RULES

NAME_____ SCORE_____

1. Match the terms to the correct definitions by choosing the definition which best identifies the term.

   1. Reference point:

      _____a. Starting point of measurement for both workpiece and rule.

      _____b. Marking found on rules and scales to denote unit of length.

      _____c. Semiprecision measuring instrument graduated in fractional or decimal parts of an inch.

   2. Reliable measure:

      _____a. Mistake in the reading or total measurement.

      _____b. Marking found on rules and scales to denote unit of length.

      _____c. Accurate or true measurement.

   3. Error:

      _____a. Mistake in the reading or total measurement.

      _____b. Starting point of measurement for both workpiece and rule.

      _____c. Semiprecision measuring instrument graduated in fractional or decimal parts of an inch.

   4. Graduation:

      _____a. Mistake in the reading or total measurement.

      _____b. Marking found on rules and scales to denote unit of length.

      _____c. Accurate or true measurement.

   5. Steel rule:

      _____a. Starting point of measurement for both workpiece and rule.

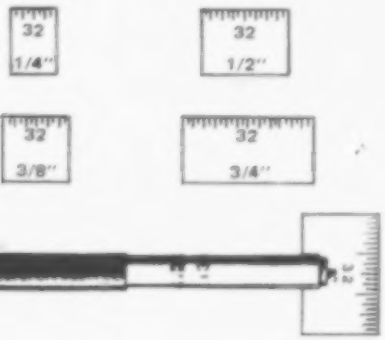
      _____b. Marking found on rules and scales to denote unit of length.

      _____c. Semiprecision measuring instrument graduated in fractional or decimal parts of an inch.

2. Name three basic units of measurement found on rules by crossing out the incorrect choices.

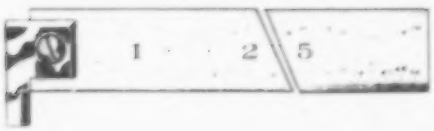
   a. Eccentric
   b. Fractional
   c. Decimal
   d. Bilateral
   e. Degree
   f. Metric

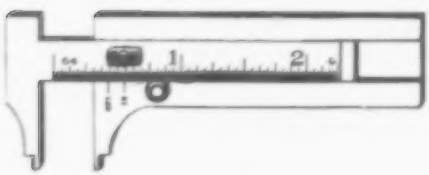
3. Identify types of steel rules used in shop work shown in the illustrations below by matching the correct numbers in the blanks provided.

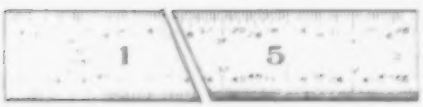


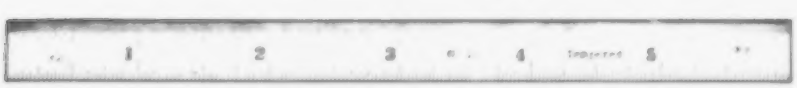
a. _____

1. Slide caliper rule
2. Hook rule
3. Narrow flexible rule
4. Steel rule
5. Short rule with holder

b. _____ 

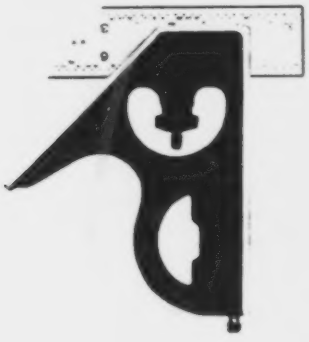
c. _____ 

d. _____ 

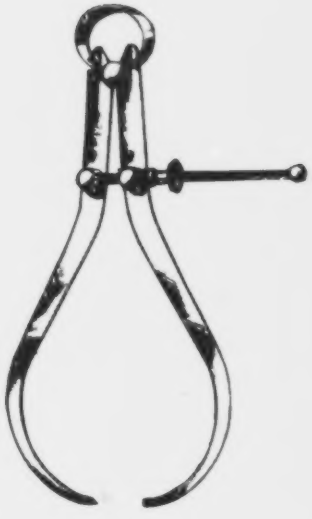
e. _____ 

4. Identify accessories used with steel rules shown below by writing the numbers in the blanks provided.

a._____



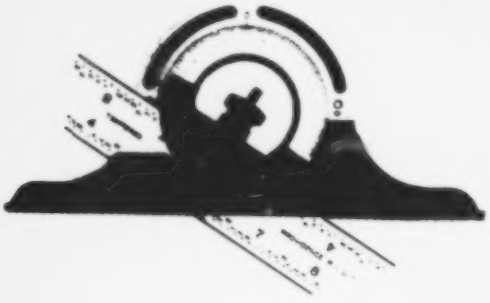
b._____



c._____

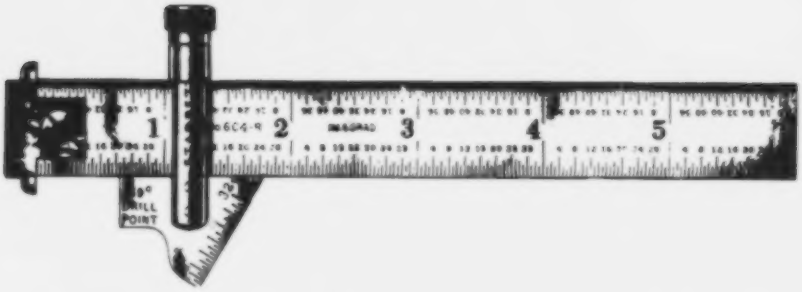
1. Divider
2. Center head
3. Hook rule with drill point gage
4. Inside caliper
5. Square head
6. Depth gage
7. Key seat clamps
8. Protractor head
9. Outside caliper
10. Rule clamps

d._____

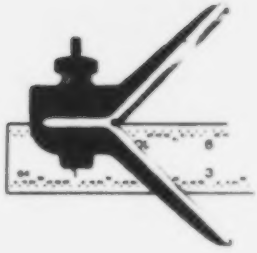


e._____

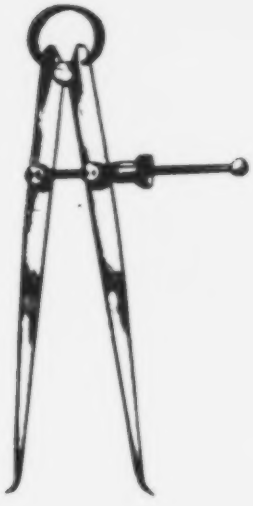
f. _____



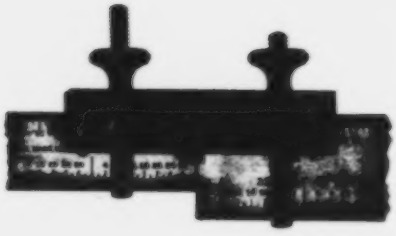
g. _____



h. _____

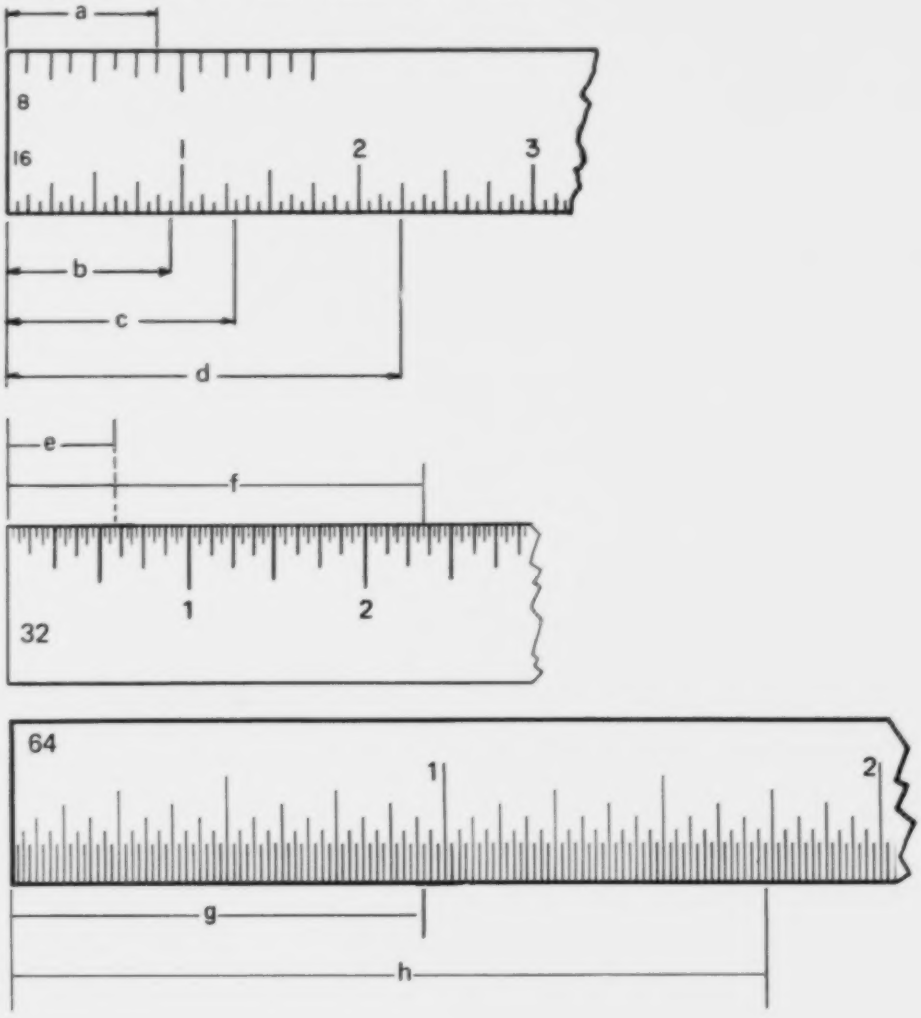


i._____



j._____

5. Read the steel rules shown below and write the correct measurement in its simplest form in the blanks provided.



a. _____

b. _____

c. _____

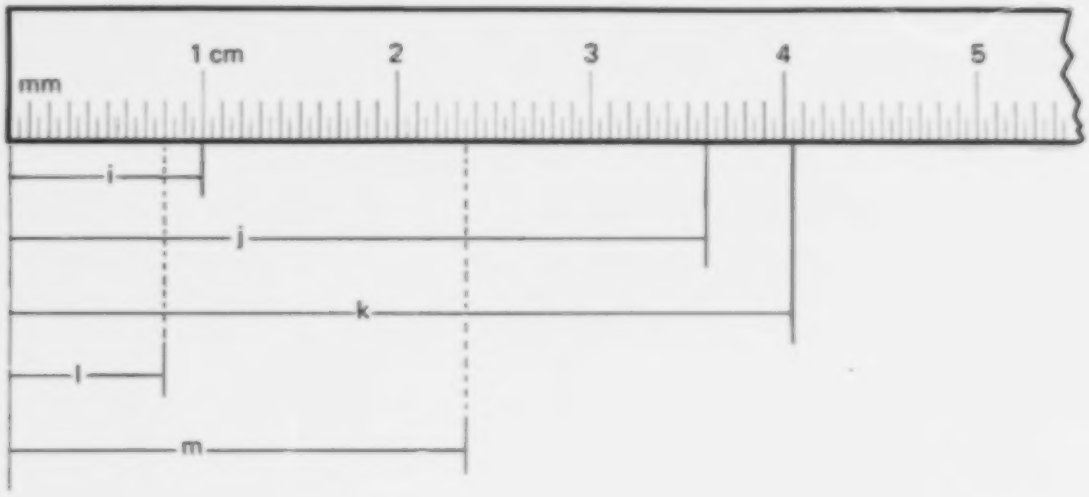
d. _____

e. _____

f. _____

g. _____

h. _____



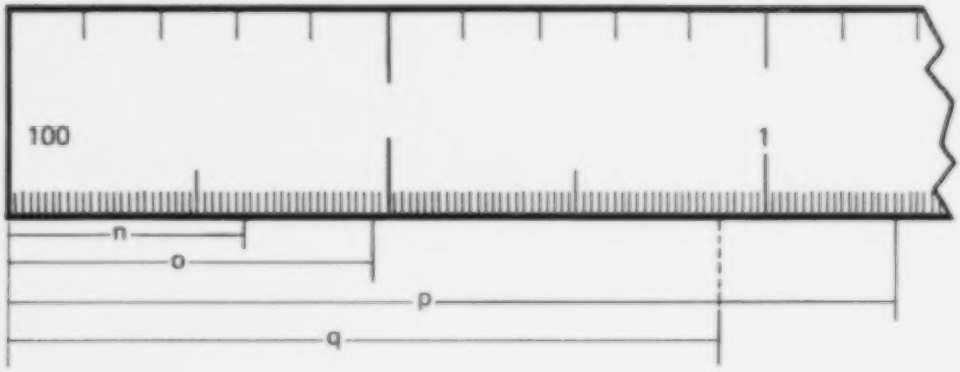
i. _____

j. _____

k. _____

l. _____

m. _____



n. _____

o. _____

p. _____

q. _____

6. Stop. Have your instructor evaluate your Assignment Sheet and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I_____ IV_____

II_____ V_____

III_____

If any of the above study areas is checked, study these sections and continue to LAP Step 6. Otherwise, proceed to LAP Step 7.

BASIC AND RELATED TECHNOLOGY
UNIT III

LAP ASSIGNMENT SHEET #2--RULES

NAME_____ SCORE_____

1. Match terms associated with linear measurement to the correct definitions. Write the correct numbers in the blanks provided.

_____a.	An accurate or true measurement	1.	Steel rule
_____b.	A mistake in the reading or total measurement	2.	Graduations
		3.	Error
_____c.	Nonprecision measuring instrument graduated in fraction, decimal, or metric parts of units	4.	Reliable measurements
_____d.	Markings found on rules; denote units of length	5.	Reference point
_____e.	The starting point of measurement for both workpiece and rule		

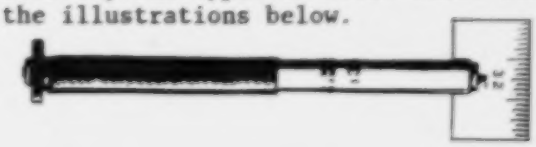
2. Name the basic units of measurement found on steel rules by completing the words below.

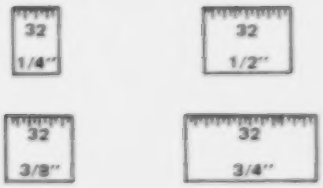
a. M_____

b. D_____

c. F_____

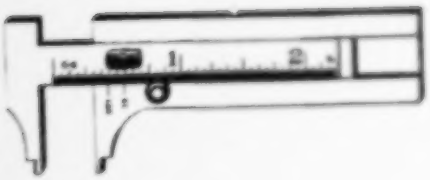
3. Identify the types of steel rules used in shop work by correctly labelling the illustrations below.



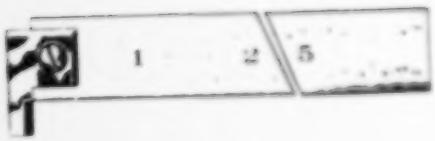


a._____

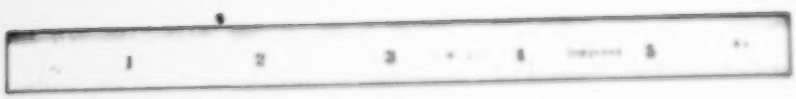
b. _____



c. _____

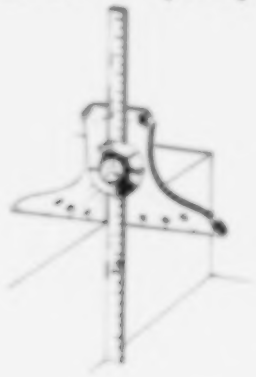


d. _____



e. _____

4. Identify the accessories used with steel rules shown below by writing the correct name in the space provided.

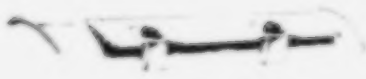


a. _____

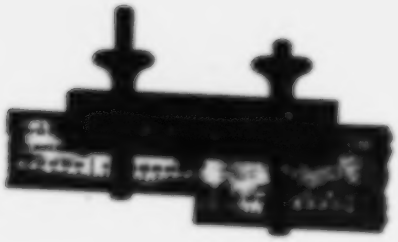
b. _____

c. _____

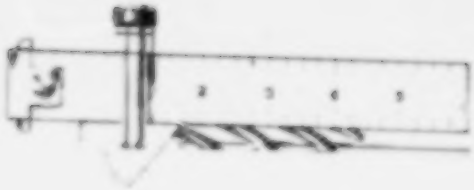
d. _____



e. _____



f. _____



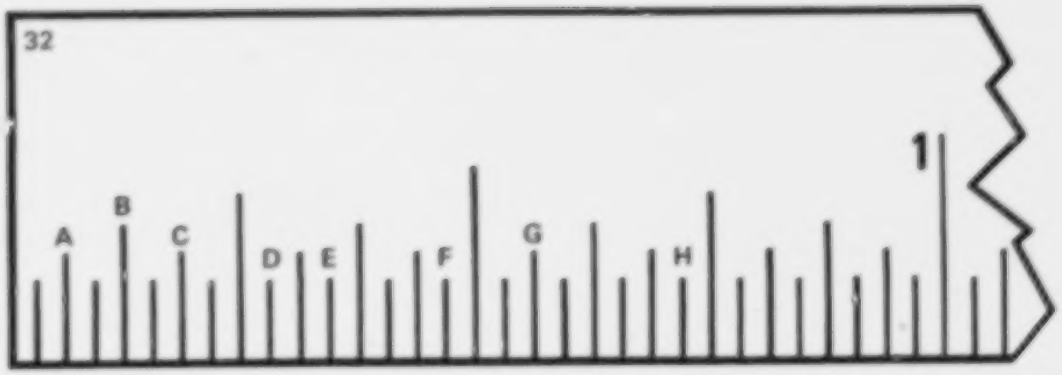
g. _____

h. _____

i. _____

j. _____

5. Read the steel rules shown below and on the next page and write the correct measurement in its simplest form in the blanks provided.



a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

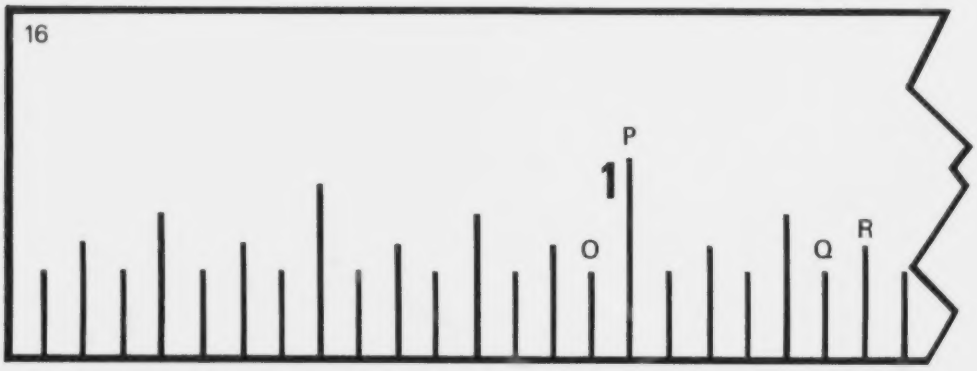
g. _____

h. _____

i. _____ l. _____

j. _____ m. _____

k. _____ n. _____



o. _____ q. _____

p. _____ r. _____

6. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 7. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 7.

BASIC AND RELATED TECHNOLOGY
UNIT I

LAP ASSIGNMENT SHEET #3--CONSTRUCT STRAIGHT LINES USING STEEL RULE

NAME_____ SCORE_____

DIRECTIONS: With the steel scale, draw straight lines of the following lengths in the space provided.

1. 2 3/8 inches
2. 1 1/2 inches
3. 3 3/4 inches
4. 4 3/16 inches
5. 37/64 inches
6. 1 7/8 inches
7. 4 19/32 inches
8. 3 1/4 inches
9. 2 31/32 inches
10. 4 5/8 inches
11. 1 3/64 inches
12. 2 7/16 inches
13. 5 1/8 inches
14. 3 51/64 inches
15. 1 9/16 inches
16. 4 27/32 inches
17. 2 33/64 inches
18. 3 15/32 inches
19. 4 11/16 inches
20. 1 17/32 inches

21. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisifed with your performance, continue to LAP Step 11. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 11.

BASIC AND RELATED TECHNOLOGY
UNIT III

ASSIGNMENT SHEET #4--USE STEEL RULES TO MEASURE LENGTH OF LINES

NAME_____ SCORE_____

1. Measure these lines to the nearest quarter of an inch.

   a. _____

   b. _____

   c. _____

   d. _____

2. Measure these lines to the nearest eighth of an inch.

   a. _____

   b. _____

   c. _____

   d. _____

3. Measure these lines to the nearest sixteenth of an inch.

   a. _____

   b. _____

   c. _____

   d. _____

4. Measure these lines to the nearest thirty-second of an inch.

   a. _____

   b. _____

   c. _____

   d. _____

5. Measure these lines to the nearest sixty-fourth of an inch.

   a. _____

   b. _____

   c. _____

   d. _____

6. Measure these lines to the nearest centimeter.

   a. ____

   b. _____

   c. _____

   d. _____

7. Measure these lines to the nearest millimeter.

   a. _____

   b. _____

   c. _____

   d. _____

8. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisifed with your performance, continue to LAP Step 15. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 15.

State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for MACHINE SHOP I

LAP NO. _____ CODE: _____

MAJOR INSTRUCTIONAL AREA

BASIC AND RELATED TECHNOLOGY

INSTRUCTIONAL UNIT

MICROMETER MEASURING TOOLS
SECTION B--UNIT IV

LEARNING ACTIVITY PACKET NO.
6

PREREQUISITE LAP(S)
1, 3, 5

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities and performance tasks for "Micrometer Measuring Tools." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training and in achieving a SKILLED or MODERATELY SKILLED competency level in the performance of jobs associated with this specialty.

INTRODUCTION: The course of study in this LAP will help the student become able to read and use the common types of micrometer measuring tools.

TASKS INCLUDED IN THIS LAP:

1. Use the outside vernier micrometer.
2. Use the depth micrometer.
3. Use the inside micrometer.

MACHINE SHOP I
MICROMETER MEASURING TOOLS
SECTION B--UNIT IV

LEARNING STEPS

Check the Following
Blanks as You Complete
the Required Steps.

_____1.	Read	Unit and Specific Objectives, page 227-B.
_____2.	Complete	Micrometer Measuring Tools Pre-Test, LAP Page 7.
_____3.	Study	The sections of the Information Sheet, pages 233-B through 246-B, indicated by your instructor on your Pre-Test. Be sure to refer to the Transparency Masters, when required.
_____4.	Refer	To Step 7 of your Pre-Test. If additional study is indicated for any of Sections I, IV, or V, continue to Step 5. Otherwise, proceed to Step 7.
_____5.	Do	LAP Assignment Sheet #1, LAP page 15.
_____6.	Do	LAP Assignment Sheet #2, LAP page 19.
_____7.	Refer	To Step 7 of your Pre-Test. If additional study is indicated for Section II, continue to Step 8. Otherwise, proceed to Step 11.
_____8.	Do	Assignment Sheet #1--Name Major Parts of the Outside Vernier Micrometer, page 247-B.
_____9.	Stop.	Have your instructor evaluate Assignment Sheet #1. If your instructor is satisfied with your performance, proceed to Step 11. Otherwise, continue to Step 10.

_____10. Do — LAP Assignment Sheet #3, LAP page 21.

_____11. Refer — To Step 7 of your Pre-Test. If additional study is indicated for Section III, continue to Step 12. Otherwise, proceed to Step 15.

_____12. Do — Assignment Sheet #2--Select Proper Micrometer, page 249-B.

_____13. Stop. — Have your instructor evaluate Assignment Sheet #2. If your instructor is satisfied with your performance, proceed to Step 15. Otherwise, continue to Step 14.

_____14. Do — LAP Assignment Sheet #4, LAP Page 13.

_____15. Refer — To Step 7 of your Pre-Test. If additional study is required for Section VI, continue to Step 16. Otherwise, proceed to Step 19.

_____16. Do — Assignment Sheet #3--Read Micrometer Settings, page 251-B.

_____17. Stop. — Have your instructor evaluate Assignment Sheet #3. If your instructor is satisfied with your performance, proceed to Step 19. Otherwise, continue to Step 18.

_____18. Do — LAP Assignment Sheet #5, LAP page 25.

_____19. Check The tasks below which you feel that you can perform without supervision.

Student Check		Instructor Initials/Date	
		Skilled	Moderately Skilled
_____a.	Use the outside vernier micrometer (22).	_____	_____
_____b.	Use the depth micrometer (28).	_____	_____
_____c.	Use the inside micrometer (34).	_____	_____

_____20. Discuss Your competency in each task with your instructor. Your instructor will initial each task in which you demonstrate sufficient competency. If all tasks have been initialed, proceed to Step 40. Otherwise, continue to Step 21.

_____21. Refer To Step 19a. If this task has been initialed, proceed to Step 27. Otherwise, continue to Step 21.

_____22. Study Job Sheet #1--Use the Outside Vernier Micrometer, page 259-B.

_____23. Watch Slide/Tape presentation "Use the Outside Vernier Micrometer" (B-IV-1).

_____24. Do Job Sheet #1--Use the Outside Vernier Micrometer.

_____25. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLEd rating, have your instructor initial Step 19a and proceed to Step 27. Otherwise, repeat Steps 22-24 and then go to Step 26.

_____26. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19a and continue to Step 27. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 19a and continue to Step 27.

_____27. Refer To Step 19b. If this task has been initialed, proceed to Step 33. Otherwise, continue to Step 28.

_____28. Study Job Sheet #2--Use the Depth Micrometer, page 261-B.

_____29. Watch Slide/tape presentation "Use the Depth Micrometer" (B-IV-2).

_____30. Do Job Sheet #2--Use the Depth Micrometer.

_____31. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19b and proceed to Step 33. Otherwise, repeat Steps 28-30 and then go to Step 32.

_____32. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19b and continue to Step 33. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 19b and continue to Step 33.

_____33. Refer To Step 19c. If this task has been initialed, proceed to Step 39. Otherwise, continue to Step 32.

_____34. Study Job Sheet #3--Use the Inside Micrometer, page 263-B.

_____35. Watch — Slide/tape presentation "Use the Inside Micrometer" (B-IV-3).

_____36. Do — Job Sheet #3--Use the Inside Micrometer.

_____37. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19c and proceed to Step 39. Otherwise, repeat Steps 34-36 and then go to Step 38.

_____38. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19c and continue to Step 39. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 19c and continue to Step 39.

_____39. Refer — To Step 19. If all tasks have been initialed, continue to Step 40. Otherwise, refer to the step indicated in parentheses after the unsigned task.

_____40. Review — Information Sheet (page 240-B) and Assignment Sheets 1-3.

_____41. Take — Micrometer Measuring Tools Unit IV Test (see your instructor). If your score is 85 percent or above, continue to the next Learning Activity Packet. If you do not score 85 percent or above, ask your instructor about additional study requirements and possible re-testing.

MICROMETER MEASURING TOOLS
UNIT IV
PRE-TEST

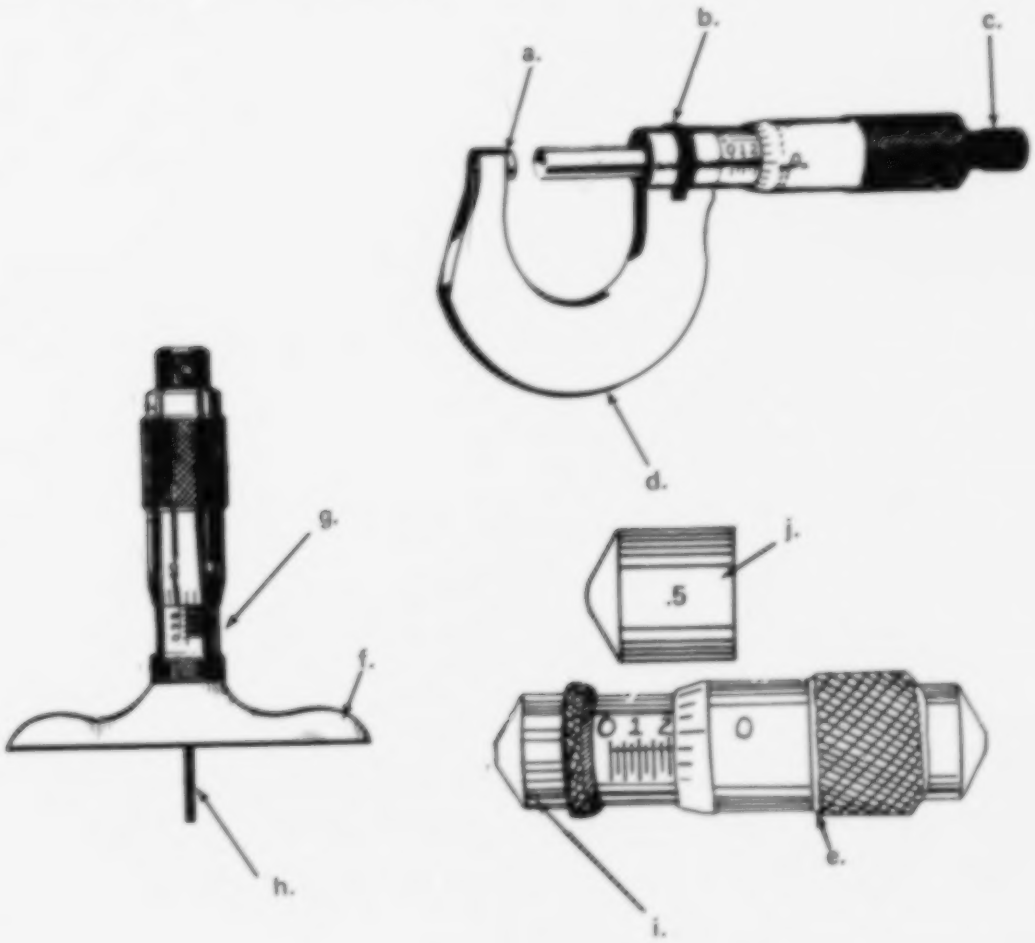
NAME_____ SCORE_____

DIRECTIONS: This test is to determine how much you already know about micrometer measuring tools. You performance on this test will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you know the answer. Guessing may prevent you from receiving the lessons which are required.

1. Match terms associated with micrometers to the correct definitions. Write the correct numbers in the blanks.

_____a.	Sizes that the micrometer can measure	1.	Pitch
_____b.	Tool used to check or calibrate a micrometer	2.	Scale
		3.	Standard
_____c.	Amount of tightness a person uses when measuring with a micrometer	4.	Range
		5.	Feel
_____d.	Distance from one thread to the corresponding point of the next thread	6.	Tangent
_____e.	A unit of measurement	7.	Calibrate
_____f.	Two lines in the same plane and an equal distance from each other, never meeting no matter how far extended	8.	Parallel
_____g.	Line that touches the circumference of a circle at one point only		
_____h.	To measure or check against a standard		

2. Name the major parts of the micrometers pictured below. Write the correct names in the blanks provided.



a. _____ f. _____

b. _____ g. _____

c. _____ h. _____

d. _____ i. _____

e. _____ j. _____

4. State rules for the proper care and use of the micrometer by discussing these eight aspects of care and use.

a. Storage -- _____

_____

b. Cleaning -- _____

_____

c. Handling -- _____

_____

d. Overtightening -- _____

_____

e. Rapid movement -- _____

_____

f. Holding -- _____

_____

g. Measuring -- _____

_____

h. Inspecting -- _____

_____

5. Describe how parts of the micrometer work.

a. Calibration of micrometer -- _____

_____

_____

_____

b. Barrel or sleeve -- _____

_____

_____

_____

c. Thimble -- _____

_____

_____

_____

d. Vernier scale -- _____

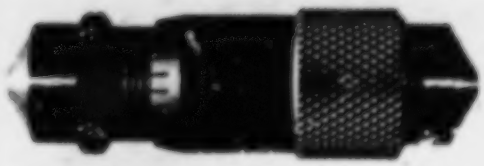
_____

_____

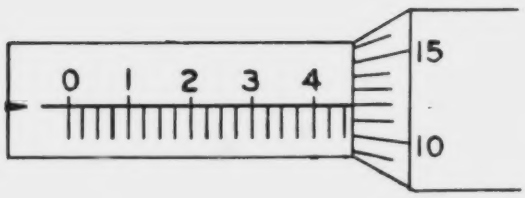
_____

6. a. Read these inside micrometer settings and write your answers in the spaces provided.

1) _____ 2) _____



3) _____ 4) _____



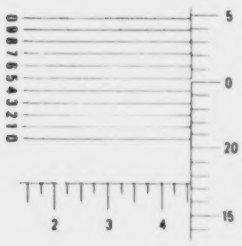
5) _____

b. Read the vernier micrometer settings and write your answers in the spaces provided.

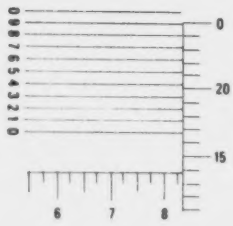
Answers

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

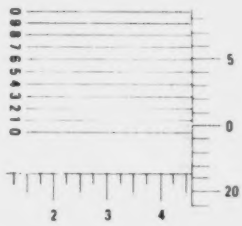
1.



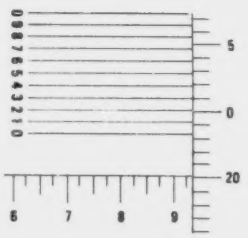
2.



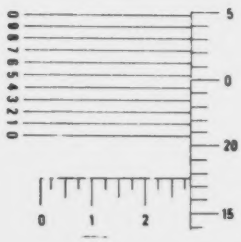
3.



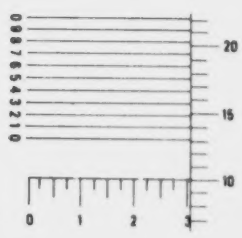
4.



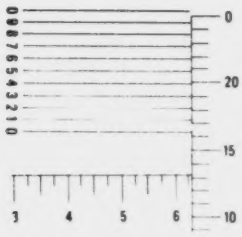
5.



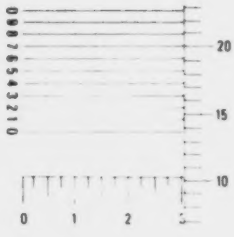
6.



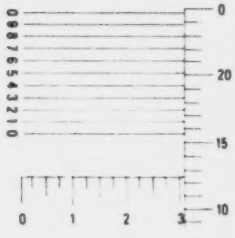
7.



8.



9.



1) _____ 6) _____

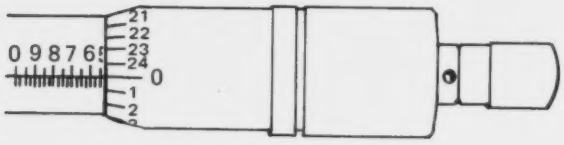
2) _____ 7) _____

3) _____ 8) _____

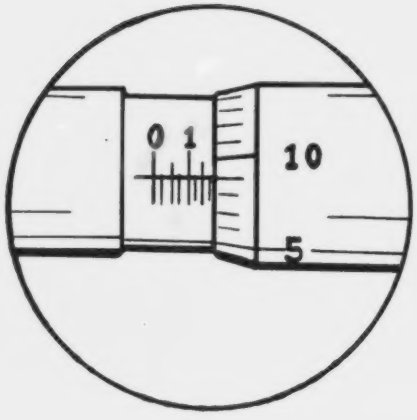
4) _____ 9) _____

5) _____ 10) _____

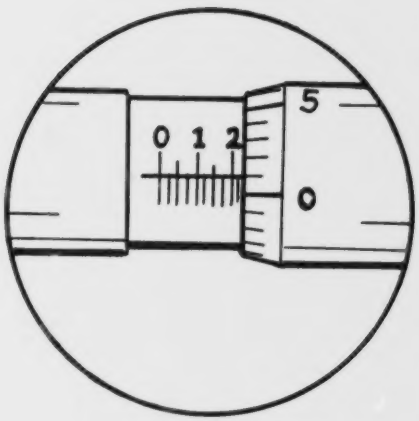
c. Read the depth micrometer settings and write your answers in the spaces provided.



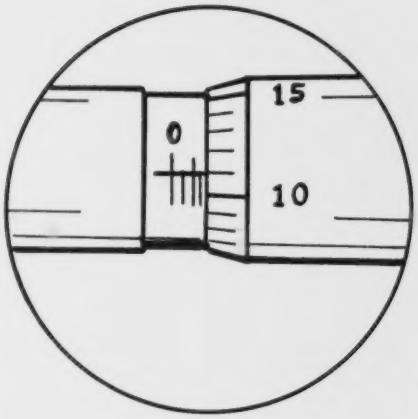
1) _____



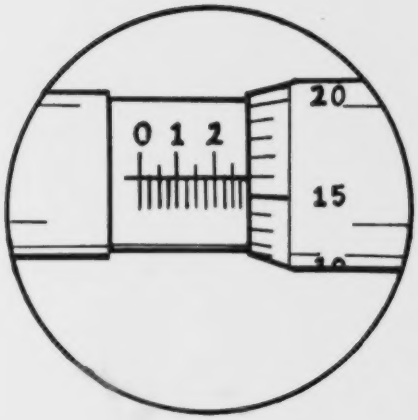
2) _____



3) _____



4) _____



5) _____

7. Stop. Have your instructor evaluate your Pre-Test and mark the areas below which require additional study.

Refer to Informaton Sheet, Sections:

I_____	IV_____
II_____	V_____
III_____	VI_____

If any of the above steps is checked, continue to LAP Step 3. Otherwise, proceed to Step 19.

BASIC AND RELATED TECHNOLOGY
UNIT IV

LAP ASSIGNMENT SHEET #1--MICROMETER MEASURING TOOLS

NAME_____ SCORE_____

1. Match these terms associated with micrometers to their correct definitions by checking the definitions which most correctly identifies the term.

   1. Parallel:

      _____a. Tool used to check or calibrate a micrometer

      _____b. Two lines in the same plane and an equal distance from each other, never meeting no matter how far extended

      _____c. Line that touches the circumference of a circle at one point only

   2. Calibrate:

      _____a. Tool used to check or calibrate a micrometer

      _____b. A unit of measurement

      _____c. To measure or check against a standard

   3. Tangent:

      _____a. A unit of measurement

      _____b. Line that touches the circumference of a circle at one point only

      _____c. To measure or check against a standard

   4. Feel:

      _____a. Tool used to check or calibrate a micrometer

      _____b. Amount of tightness a person uses when measuring with a micrometer

      _____c. To measure or check against a standard.

   5. Range:

      _____a. Sizes that a micrometer can measure

      _____b. Amount of tightness a person uses when measuring with a micrometer

      _____c. Distance from one thread to the corresponding point of the next thread

6. Standard

_____a. Tool used to check or calibrate a micrometer

_____b. A unit of measurement

_____c. To measure or check against a standard

7. Scale:

_____a. Tool used to check or calibrate a micrometer

_____b. A unit of measurement

_____c. Distance from one thread to the corresponding point of the next thread

8. Pitch:

_____a. Amount of tightness a person uses when measuring with a micrometer

_____b. Distance from one thread to the corresponding point of the next thread

_____c. Line that touches the circumference of a circle at one point only

2. State rules for proper care and use of the micrometer by completing the statements below.

a. Storage -- Keep micrometers in a place free of _____, _____, and _____ _____.

b. Cleaning -- Always wipe the instrument off with a _____ _____ after using.

c. Handling -- Do not throw the instrument around; handle with _____.

d. Misuse -- Do not use a micrometer as a C-clamp; _____ will cause threads to be stretched and micrometer to lose its accuracy.

e. Rapid movement -- Do not run the _____ in or out by holding the thimble and swinging the frame; hold the frame and pull or push the thimble in the _____ of your hand.

f. Holding -- Hold the micrometer _____ when using it, taking care not to _____ it.

g. Measuring -- Hold the frame with your left hand and rotate the _____ with the thumb and index finger of the right hand to reach the proper _____ (amount of tightness).

3. Describe how the parts of the micrometer work by completing the statements below.

   a. Calibration of micrometer is determined by the threaded portion of the spindle which has _____ threads per inch.

   b. The barrel or sleeve shows the revolutions of the spindle moving lengthwise one-fourth of an inch or _____ thousandths of an inch.

   c. The thimble has a "0" line and is divided into _____ spaces around the circumference of the thimble. For easy counting, it has major lines marked off in units of _____. Each line on the thimble equals _____ thousandths of an inch.

   d. The vernier scale has lines parallel to the _____ line and is located on the barrel. Vernier lines are numbered and will divide any thousandth line on the thimble into _____ parts.

4. Stop. Have your instructor evaluate your Assignment Sheet and mark the areas below which require additional study.

   Refer to Information Sheet, Sections:

   I_____

   IV_____

   V_____

   If any of the above study areas is checked, study those sections of the Information Sheet and go to LAP Step 6. Otherwise, proceed to LAP Step 7.

BASIC AND RELATED TECHNOLOGY
UNIT IV
LAP ASSIGNMENT SHEET #2--MICROMETER MEASURING TOOLS

NAME_____ SCORE_____

1. Match these terms associated with micrometers to the correct definitions by writing the number in the space provided.

_____a.	Sizes that the micrometer can measure	1.	Standard
_____b.	Tool used to check or calibrate a micrometer	2.	Feel
_____c.	Amount of tightness a person uses when measuring with a micrometer	3.	Scale
_____d.	Distance from one thread to the corresponding point of the next thread	4.	Pitch
_____e.	A unit of measurement	5.	Parallel
_____f.	Two lines in the same plane and an equal distance from each other, never meeting no matter how far extended	6.	Range
_____g.	Line that touches the circumference of a circle at one point only	7.	Calibrate
_____h.	To measure or check against a standard	8.	Tangent

2. State the rules for proper care and use of the micrometer by explaining how each phrase applies to the care and use of the micrometer.

a. Storage --

b. Cleaning --

c. Handling --

d. Misuse --

e. Rapid movement --

f. Holding --

g. Measuring --

h. Inspecting --

3. Describe how the parts of the micrometer work.

   a. Calibration of micrometer --

   b. Barrel or sleeve --

   c. Thimble --

   d. Vernier scale --

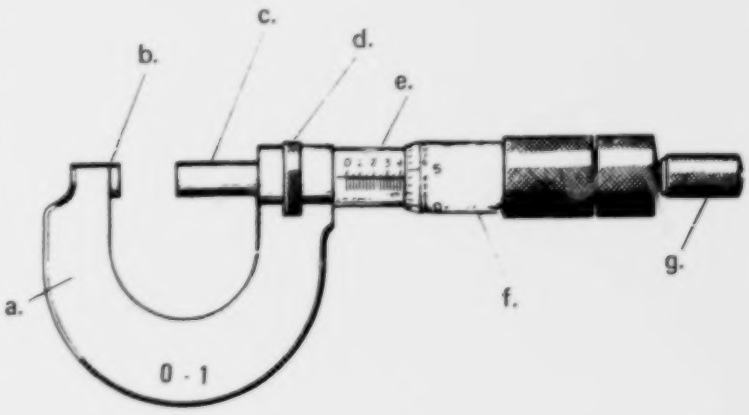
4. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 7. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 7.

MICROMETER MEASURING TOOLS
UNIT IV
LAP ASSIGNMENT SHEET #3--NAME MAJOR PARTS OF THE OUTSIDE VERNIER MICROMETER

NAME_____ SCORE_____

1. Name the parts of the micrometer in the drawing below by selecting the name from the following list and writing it in the proper blank.

a._____
b._____
c._____
d._____
e._____
f._____
g._____



2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 11. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 11.

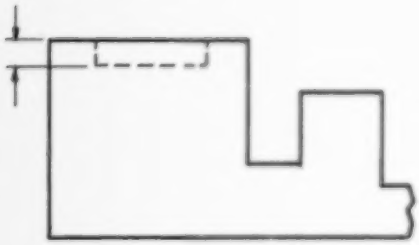
MICROMETER MEASURING TOOLS
UNIT IV
LAP ASSIGNMENT SHEET #4--SELECT PROPER MICROMETER

NAME _____ SCORE _____

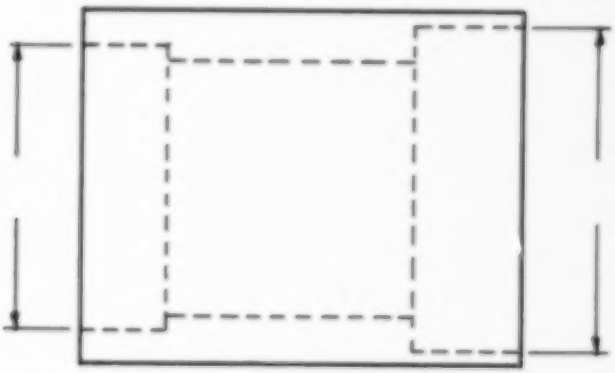
1. Select the kind of micrometer that should be used to determine the measurement shown in each figure and write the number of the micrometer in the blank beside each figure.

   1. Outside vernier micrometer
   2. Depth micrometer
   3. Inside micrometer

   a. _____

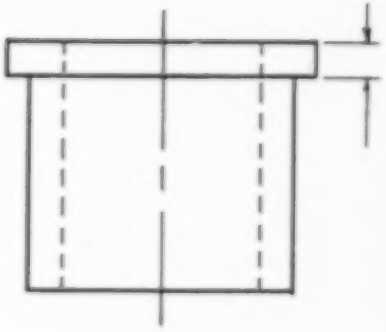


   b. _____



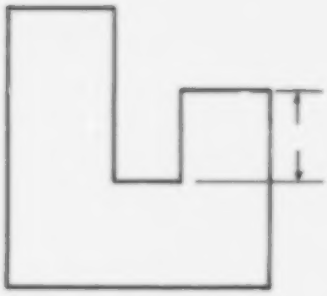
   c. _____

   d. _____

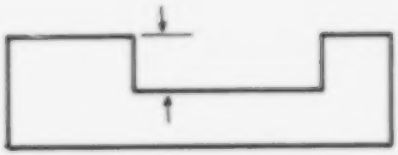


e. ____

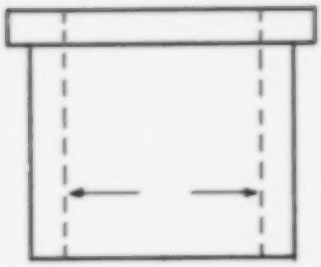
f. ____



g. ____



h. ____



2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 15. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 15.

MICROMETER MEASURING TOOLS
UNIT IV
LAP ASSIGNMENT SHEET #5--READ MICROMETER SETTINGS

NAME_____ SCORE_____

1. Record the reading for each vernier micrometer setting shown below in the spaces provided.

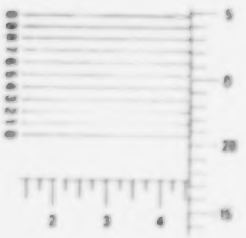
a. _____

b. _____

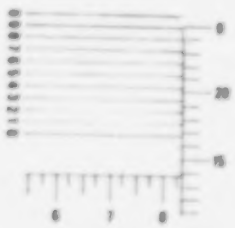
c. _____

d. _____

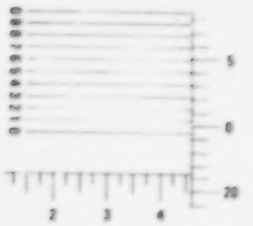
a.



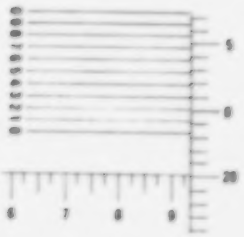
b.



c.



d.



2. Record the reading for each depth micrometer setting shown below in the space provided.

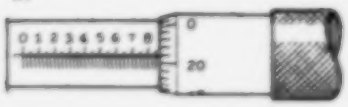
a. _____

b. _____

c. _____

d. _____

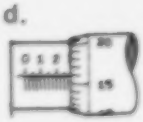
a.



b.

c.

d.



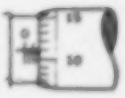
3. Record the reading of each inside micrometer shown below in the spaces provided.

a. _____

b. _____

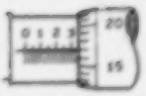
c. _____

d. _____

a. 

b.

c.

d. 

4. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 19. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 19.

State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for MACHINE SHOP I

LAP NO._____ CODE:_____

MAJOR INSTRUCTIONAL AREA

BASIC AND RELATED TECHNOLOGY

INSTRUCTIONAL UNIT

VERNIER MEASURING TOOLS
SECTION B--UNIT V

LEARNING ACTIVITY PACKET NO.

7

PREREQUISITE LAP(S)

1, 3, 5

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities and performance tasks for "Vernier Measuring Tools." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training and in achieving a SKILLED or MODERATELY SKILLED competency level in the performance of jobs associated with this specialty.

INTRODUCTION: The course of study in this LAP will help the student become able to read and use the common types of vernier measuring tools.

TASKS INCLUDED IN THIS LAP:

1. Use vernier caliper to take inside, outside, and depth measurements.
2. Use the depth vernier.
3. Use the vernier height gage for layout and inspection.
4. Use the universal bevel protractor to measure angles.

MACHINE SHOP I
VERNIER MEASURING TOOLS
SECTION B--UNIT V

LEARNING STEPS

Check the Following
Blanks as You Complete
the Required Steps

_____1. Read Unit and Specific Objectives, page 283 B.

_____2. Complete Vernier Measuring Tools Pre-Test, lap page 7.

_____3. Study The section of the Information Sheet, pages 289-B through 299-B, indicated by your instructor on your Pre-Test.

_____4. Refer To Step 8 of your Pre-Test. If additional study is indicated for any of Sections I, II, IV, or VI, continue to Step 5. Otherwise, proceed to Step 7.

_____5. Do Lap Assignment Sheet #1, LAP page 15.

_____6. Do Lap Assignment Sheet #2, LAP page 21.

_____7. Refer To Step 8 of your Pre-Test. If additional study is indicated for Section III, continue to Step 8. Otherwise, proceed to Step 11.

_____8. Do Assignment Sheet #1--Identify Major Parts of Vernier Tools, page 301-B.

_____ 9. Stop. Have your instructor evaluate Assignment Sheet #1. If your instructor is satisfied with your performance, proceed to Step 11. Otherwise, continue to Step 10.

_____10. Do — LAP Assignment Sheet #3, LAP page 25.

_____11. Refer — To Step 8 of your Pre-Test. If additional study is indicated for Section V, continue to Step 12. Otherwise, proceed to Step 15.

_____12. Do — Assignment Sheet #2--Select the Correct Vernier Tool, page 303-B.

_____13. Stop — Have your instructor evaluate Assignment Sheet #2. If your instructor is satisfied with your performance, proceed to Step 15. Otherwise, continue with Step 14.

_____14. Do — LAP Assignment Sheet #4, LAP page 27.

_____15. Refer — To Step 8 of your Pre-Test. If additional study is indicated for Section VII, continue to Step 16. Otherwise, proceed to Step 19.

_____16. Do — Assignment Sheet #3--Read the Vernier, page 307-B.

_____17. Stop — Have your instructor evaluate Assignment Sheet #3. If your instructor is satisfied with your performance, proceed to Step 19. Otherwise, continue to Step 18.

_____18. Do — LAP Assignment Sheet #5, LAP page 31.

_____19. Check The tasks below which you feel that you can perform without supervision.

Student Check		Instructor's Initials/Date	
		Skilled	Moderately Skilled
_____a.	Use vernier caliper to take inside, outside and depth measurements (22)	_____	_____
_____b.	Use the depth vernier (28)	_____	_____
_____c.	Use the vernier height gage for layout and inspection (33)	_____	_____
_____d.	Use the universal bevel protractor to measure angles (39)	_____	_____

_____20. Discuss Your competency in each task with your instructor. Your instructor will initial each task in which you demonstrate sufficient competency. If all tasks have been initialed, proceed to Step 45. Otherwise, continue to Step 21.

_____21. Refer To Step 19a. If this task has been initialed, proceed to Step 27. Otherwise, continue to Step 22.

_____22. Study Job Sheet #1--Use Vernier Caliper to take Inside, Outside, and Depth Measurements, page 311-B.

_____23. Watch Slide/tape presentation, "Use Vernier Caliper to Take Inside, Outside, and Depth Measurements" (B-V-1).

_____24. Do Job Sheet #1--Use Vernier Caliper to take Inside, Outside, and Depth Measurements.

_____25. Stop — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19a and proceed to Step 27. Otherwise, repeat Steps 22-24 and then go to Step 26.

_____26. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19a and continue to Step 27. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 19a and continue to Step 27.

_____27. Refer — To Step 19b. If this task has been initialed, proceed to Step 32. Otherwise, continue to Step 28.

_____28. Study — Job Sheet #2--Use the Depth Vernier, page 315-B.

_____29. Do — Job Sheet #2--Use the Depth Vernier.

_____30. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19b and proceed to Step 32. Otherwise, repeat Steps 28 and 29 and then go to Step 31.

_____31. Stop. — Have your instructor evalute your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19b and continue to Step 32. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 19b and continue to Step 32.

_____32. Refer — To Step 19c. If this task has been initialed, proceed to Step 38. Otherwise, continue to Step 33.

_____33.	Study	Job Sheet #3--Use the Vernier Height Gage for Layout and Inspection, page 319-B.
_____34.	Watch	Slide/tape presentation, "Use the Vernier Height Gage for Layout and Inspection" (B-V-3).
_____35.	Do	Job Sheet #3--Use the Vernier Height Gage for Layout and Inspection.
_____36.	Stop.	Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial 19c and proceed to Step 38. Otherwise, repeat Steps 33-35 and then go to Step 37.
_____37.	Stop.	Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19c and continue to Step 38. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 19c and continue to Step 38.
_____38.	Refer	To Step 19d. If this task has been initialed, proceed to Step 44. Otherwise, continue to Step 39.
_____39.	Study	Job Sheet #4--Use the Universal Bevel Protractor to Measure Angles, page 323-B.
_____40.	Watch	Slide/tape presentation, "Use the Universal Bevel Protractor to Measure Angles" (B-V-4).
_____41.	Do	Job Sheet #4--Use the Universal Bevel Protractor to Measure Angles.

_____42. Stop. Have your instructor evalute your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19d and proceed to Step 44. Otherwise, repeat Steps 39-41 and then go to Step 43.

_____43. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 19d and continue to Step 44. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfation, have your instructor initial Step 19d and continue to Step 44.

_____44. Refer To Step 19. If all tasks have been initialed, continue to Step 45. Otherwise, refer to the step indicated in parentheses after the unsigned task.

_____45. Review Information Sheet (page 289-B) and Assignment Sheets 1-3.

_____46. Take Vernier Measuring Tools Unit V Test (see your instructor). If your score is 85 percent or above, continue to the next assigned Learning Activity Packet. If you do not score 85 percent or above, ask your instructor about additional study requirements and possible re-testing.

VERNIER MEASURING TOOLS
UNIT V
PRE-TEST

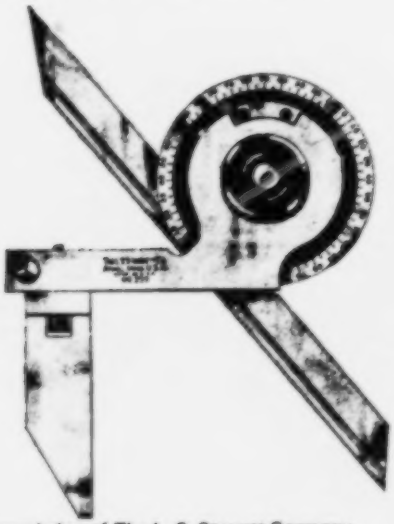
NAME _____ SCORE _____

DIRECTIONS: This test is to determine how much you already know about vernier measuring tools. Your performance on this test will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you know the answer. Guessing may prevent you from receiving the lessons which are required.

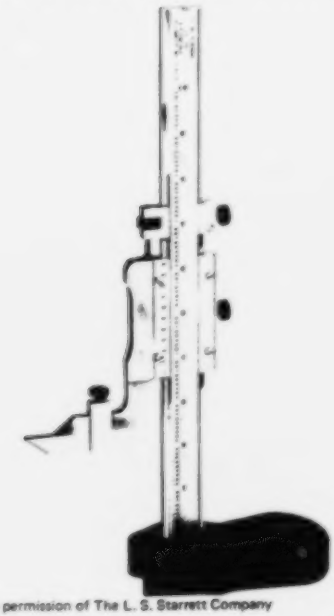
1. Match the terms associated with vernier measuring tools on the right to their definitions by writing the correct numbers in the blanks provided.

_____a.	A round surface	1. Reference surface
_____b.	A flat surface	2. Circular
_____c.	Inside measurement of a round hollowed-out part, bore, or hole	3. Plane
_____d.	A thin colored liquid (usually lacquer-based) used to paint on surface so scribed lines will show up	4. Standard
_____e.	Amount of material from one side to the other of a round object	5. Inside diameter (ID)
_____f.	Sharp, pointed tool used to draw or mark lines on material for layout	6. Nibs
_____g.	Two surfaces that intersect at a 90^{o} angle	7. Layout solution
_____h.	An important surface that is used for layout, machining, and inspections; used to take dimensions	8. Outside diameter (OD)
_____i.	Distance from one point to another	9. Perpendicular
_____j.	Black granite rectangular flat surface used for layout	10. Scriber
_____k.	Small rectangular ends on calipers	11. Surface plate
_____l.	Hardened and ground precision piece of steel used for checking or setting measuring tools	12. Length

2. Label these basic types of vernier measuring tools by writing the correct names in the blanks provided.



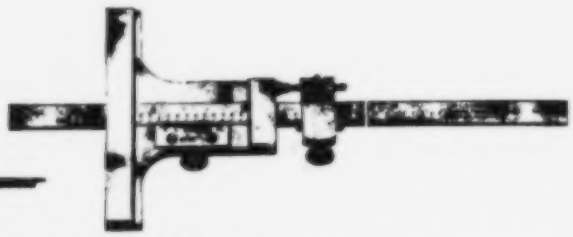
Used with permission of The L. S. Starrett Company



Used with permission of The L. S. Starrett Company

a. _____ b. _____

Used with permission of Brown & Sharpe Manufacturing Co.



Used with permission of The L. S. Starrett Company

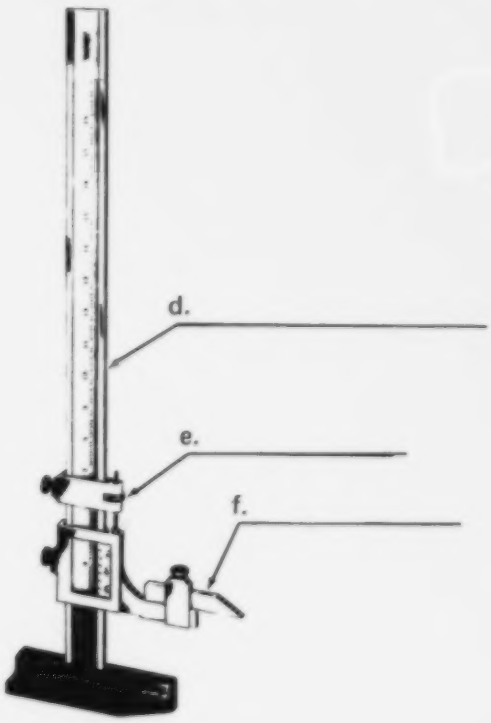
c. _____ d. _____

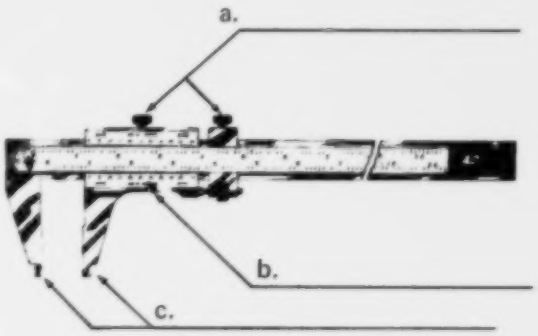
Used with permission of The L. S. Starrett Company

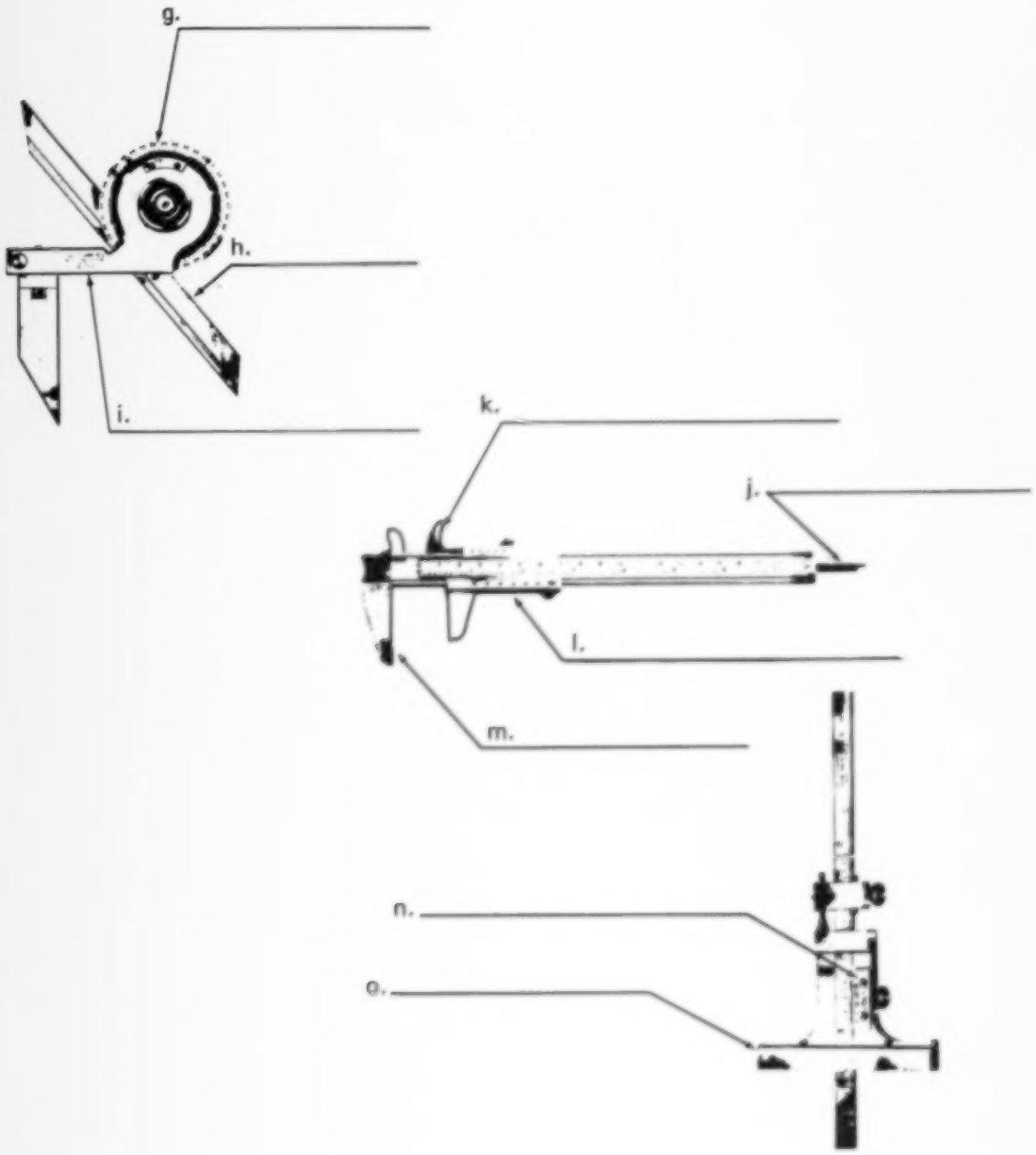
e. _____

3. Identify the major parts of the vernier measuring tools shown below by selecting the correct name from the following list and writing it in the blank provided. Note that a part name may be used more than once.

Craduated beam	Fine adjusting screw	Stock
Clamp screw(s)	Depth blade	Nibs
Outside jaws	Vernier slide	Blade
Inside jaws	Scriber	Dial
Vernier plate	Base	







4. Describe how vernier measuring tools work.

a. Main scale--_____

b. Vernier scale--_____

c. Vernier slide--_____

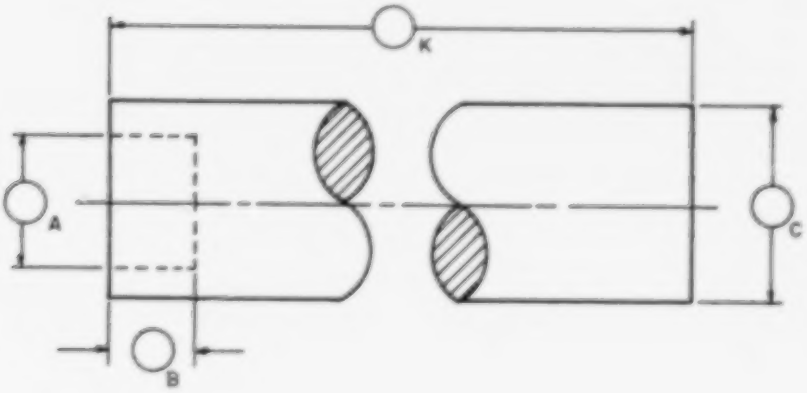
_____

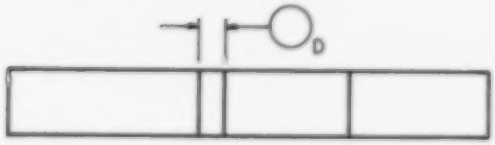
d. The reading--_____

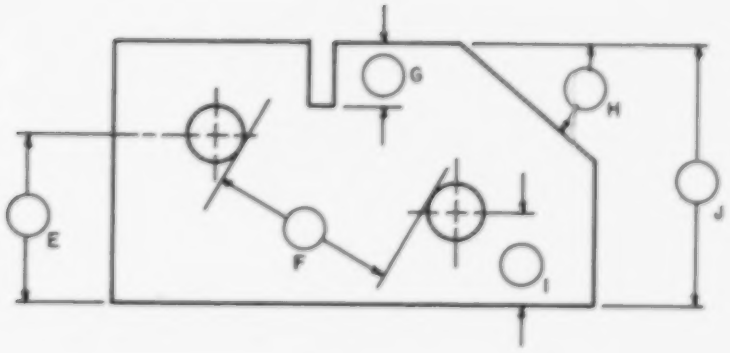
_____

5. Select the correct vernier measuring tools by placing the number of the correct tool in the circles provided. If more than one tool can be used, write the number of the most commonly-used tool.

1. Vernier caliper
2. Vernier height gage
3. Universal bevel protractor
4. Vernier depth gage







6. State the rules for proper care of vernier measuring tools by describing how each of these terms apply to the proper care of the instruments.

   a. Storage and use--_____

   _____

   _____

   b. Cleaning--_____

   _____

   c. Accuracy--_____

   _____

   d. Lock screws--_____

   _____

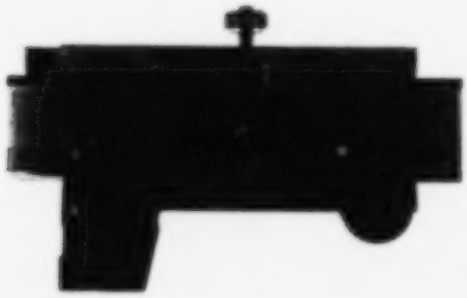
   e. Forced readings--_____

   _____

   f. Examining and checking--_____

   _____

. Read the vernier measuring tools for each setting pictured below and on the next page. Write the correct answers in the blanks provided.



a. _____

b. _____

c. _____

8. Stop. Have your instructor evaluate your Pre-Test and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I	_____	V	_____
II	_____	VI	_____
III	_____	VII	_____
IV	_____		

If any of the above study areas is checked continue to LAP Step 3. Otherwise, proceed to LAP Step 19.

BASIC AND RELATED TECHNOLOGY
UNIT V
LAP ASSIGNMENT SHEET #1--VERNIER MEASURING TOOLS

NAME _____ SCORE _____

1. Match these terms associated with vernier measuring tools to their definitions by selecting the correct choice from those provided.

   1. Nibs:

      _____a. Sharp, pointed tools used to draw or mark lines on material for layout

      _____b. Two surfaces that intersect at a 90^{o} angle

      _____c. Small rectangular ends on calipers

   2. Perpendicular:

      _____a. A flat surface

      _____b. Two surfaces that intersect at a 90^{o} angle

      _____c. An important surface that is used for layout, machining, and inspections; used to take dimensions

   3. Standard:

      _____a. Inside measurement of a round hollowed-out part, bore, or hole

      _____b. Black granite rectangular flat surface used for layout

      _____c. Hardened and ground precision piece of steel used for checking or setting measuring tools

   4. Layout solution:

      _____a. A thin colored liquid (usually lacquer-based) used to paint on surface so scribed lines will show up

      _____b. An important surface that is used for layout, machining, and inspections; used to take dimensions

      _____c. Black granite rectangular flat surface used for layout

5. Plane:

_____a. A flat surface

_____b. Sharp, pointed tool used to draw or mark lines on material for layout

_____c. Two surfaces that intersect at a 90^{o} angle

6. Surface plate:

_____a. Amount of material from one side to the other of a round object

_____b. Black granite rectangular flat surface used for layout

_____c. Hardened and ground precision piece of steel used for checking or setting measuring tools

7. Reference surface:

_____a. Two surfaces that intersect at a 90^{o} angle

_____b. An important surface that is used for layout, machining, and inspections; used to take dimensions

_____c. Black granite rectangular flat surface used for layout

8. Length:

_____a. Inside measurement of a round, hollowed-out part, bore, or hole

_____b. Amount of material from one side to another of a round object

_____c. Distance from one point to another

9. Circular:

_____a. A round surface

_____b. Inside measurement of a round hollowed-out part, bore, or hole

_____c. Amount of material from one side to the other of a round object

10. Scriber:

_____a. A thin colored liquid (usually lacquer-based) used to plant on surface so scribed lines will show up

_____b. Sharp, pointed tool used to draw or mark lines on material

_____c. Hardened and ground precision piece of steel used for checking or setting measuring tools

11. Inside diameter (ID):

_____a. A round surface

_____b. Inside measurement of a round hollowed out part, bore, or hole

_____c. Amount of material from one side to the other of a round object

12. Outside diameter (OD):

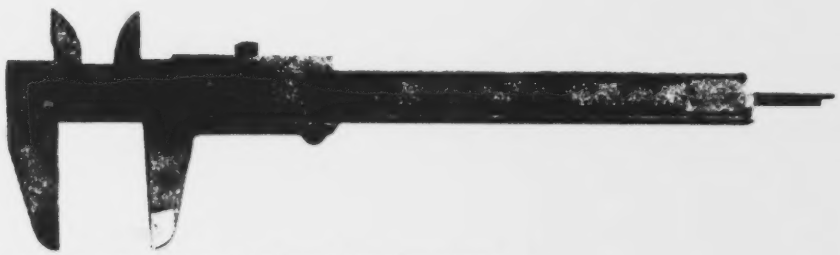
_____a. A round surface

_____b. Inside measurement of a round hollowed out part, bore, or hole

_____c. Amount of material from one side to the other of a round object

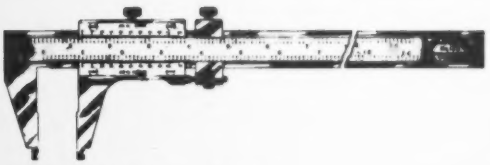
2. Label these basic types of vernier measuring tools by choosing the name from the following list and writing it in the correct blank.

Universal vernier caliper
Standard vernier caliper
Vernier depth gage
Vernier height gage
Universal bevel protractor

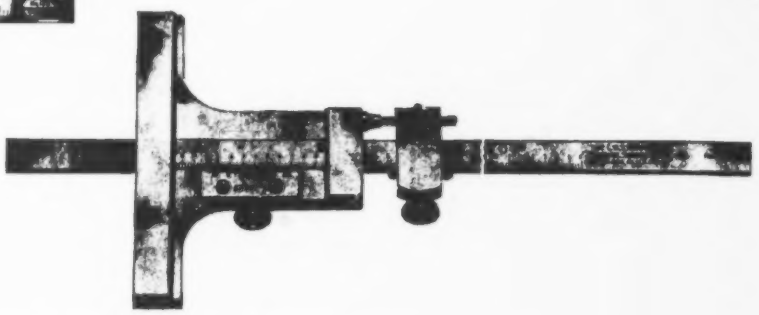


Used with permission of Brown & Sharpe Manufacturing Co.

a. _____

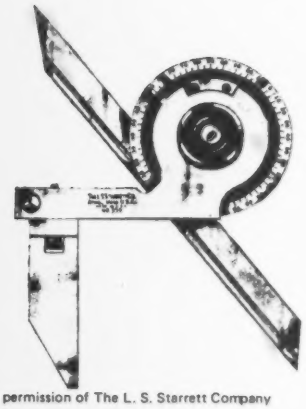


Used with permission of The L. S. Starrett Company

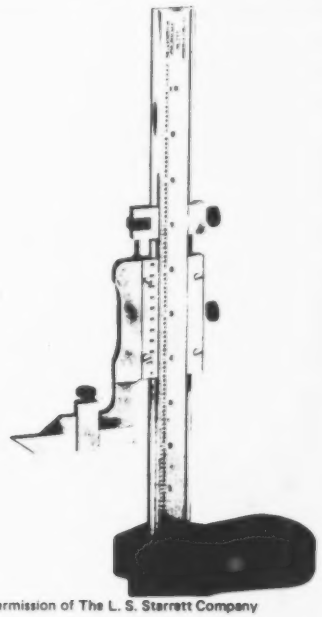


Used with permission of The L. S. Starrett Company

b. _____ c. _____



Used with permission of The L. S. Starrett Company



Used with permission of The L. S. Starrett Company

d. _____ e. _____

3. Describe how vernier measuring tools work by completing the following statements.

   a. The main scale is divided into units and _____.

   b. The vernier scale divides the sub-units into _____ of sub-units.

   c. The vernier slide carries the _____ up and down the main scale; it can be adjusted with the _____ screw and locked in place with the _____ screw.

   d. The reading is obtained by combining the readings of the two _____

4. State the rules for proper care of vernier measuring tools by completing the following statements.

   a. Storage and use--Alwasys keep vernier measuring tools free of _____, _____, and other foreign matter; lay the tools on a clean _____ _____, never directly on a metal surface.

   b. Cleaning--After using a vernier measuring tool, wipe it with a clean _____ rag and apply a thin coat of _____ _____.

   c. Accuracy--Never throw these tools around; handle them _____ so they will maintain their accuracy for years.

   d. Lock screws--Make sure the lock screws are _____ before attempting to move the sliding jaw.

   e. Forced readings--Do not try to force a reading; it is easy to spring the _____, causing the tool to lose its _____.

   f. Examining and checking--Examine the vernier and check it with a _____ to ensure accuracy.

5. Stop. Have your instructor evaluate your Assignment Sheet and work the areas below which require additional study.

   Refer to Information Sheet, Sections:

   I _____
   II _____
   III _____
   IV _____

If any of the above study areas is checked, study the applicable section(s) of the Information Sheet and then continue to LAP Step 6. Otherwise, proceed to LAP Step 7.

BASIC AND RELATED TECHNOLOGY
UNIT V
LAP ASSIGNMENT SHEET #2--VERNIER MEASURING TOOLS

NAME _____ SCORE _____

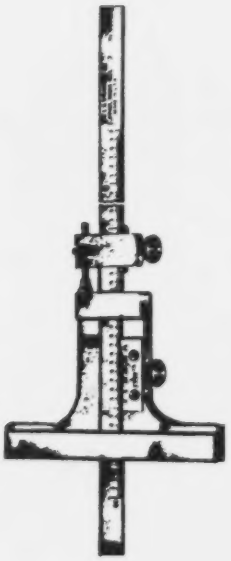
1. Match these terms associated with vernier measuring tools to the correct definitions by writing the number of the term in the blank beside the proper definitions.

_____a.	A round surface	1. Scriber
_____b.	A flat surface	2. Outside diameter (OD)
_____c.	Inside measurement of a round hollowed-out part, bore, or hole	3. Surface plate
_____d.	A thin colored liquid (usually lacquer-based) used to paint on surface so scribed lines will show up	4. Circular
_____e.	Amount of material from one side to the other of a round object	5. Layout solution
_____f.	Sharp, pointed tool used to draw or mark lines on material for layout	6. Length
_____g.	Two surfaces that intersect at a 90^{o} angle	7. Nibs
_____h.	An important surface that is used for layout, machining, and inspections; used to take dimensions	8. Plane
_____i.	Distance from one point to another	9. Inside diameter (ID)
_____j.	Black granite rectangular flat surface used for layout	10. Perpendicular
_____k.	Small rectangular ends on calipers	11. Reference surface
_____l.	Hardened and ground precision piece of steel used for checking or setting measuring tools	12. Standard

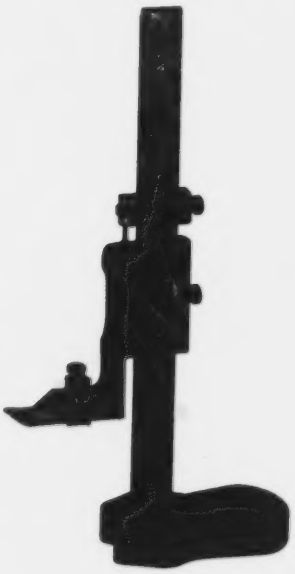
2. Label these basic types of vernier measuring tools by writing the correct names in the blanks provided.

a. _____

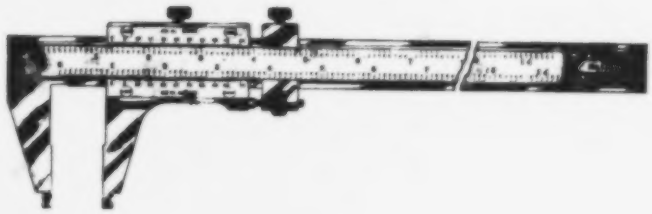
b. _____



c. _____



d. _____



e. _____

3. Describe how vernier measuring tools work by completing the following statements.

   a. The main scale is divided into _____ and _____.

   b. The vernier scale divides the _____ into _____ of _____.

   c. The vernier slide carries the _____ up and down the _____ _____; it can be adjusted with the _____ _____ _____ and locked in place with the _____ _____.

   d. The reading is obtained by _____ the _____ of the _____ _____.

4. State the rules for proper care of vernier measuring tools by completing the following statements.

   a. Storage and use--Always keep vernier measuring tools free of _____, _____, and _____ _____ _____; lay them on a _____ _____ _____, never directly on a _____ _____.

   b. Cleaning--After using, wipe the tool with a _____ _____ _____ and apply a _____ _____ of _____ _____.

   c. Accuracy--Never _____ the tools around; handle them _____ so they will maintain their _____ for years.

   d. Lock screws--Make sure the lock screws are loosened before attempting to _____ the _____ _____.

e. Forced readings--Do not try to force a reading; it is easy to _____ the _____, causing the tool to lose its _____.

f. Examining and checking--Examine the vernier and check it with a _____ to ensure _____.

5. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 7. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 7.

VERNIER MEASURING TOOLS
UNIT V
LAP ASSIGNMENT SHEET #3--IDENTIFY THE MAJOR PARTS OF VERNIER TOOLS

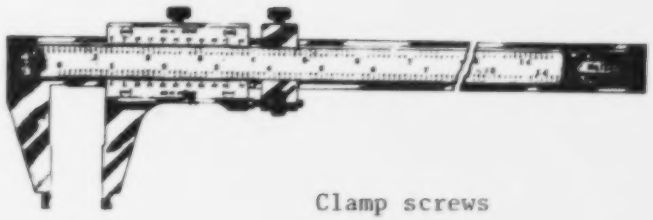
NAME _____ SCORE _____

1. Identify the parts of the vernier tools pictured below and on the next page by drawing a line from the term to its correct location on the tool.

a. Clamp screw Outside jaws Depth blade

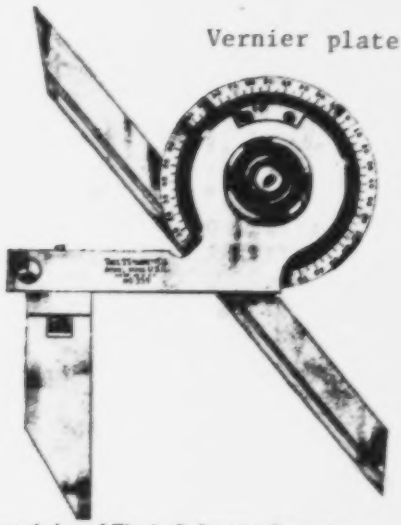
Vernier Slide Inside jaw Graduated beam

b. Fine adjusting screw Vernier slide



Nibs Clamp screws Graduated beam

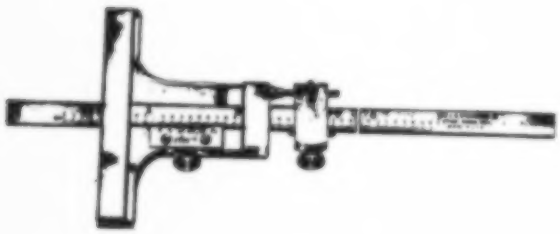
c. Dial Vernier plate



Stock Blade

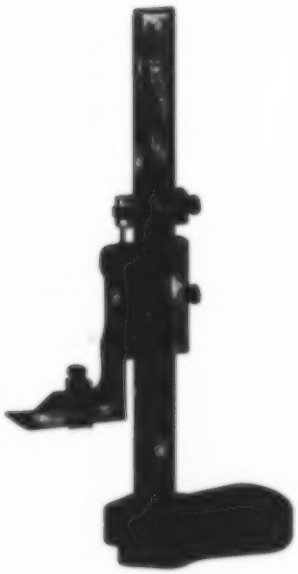
Used with permission of The L. S. Starrett Company

d. Clamp screws Base Graduated Beam



Vernier slide Vernier plate

e. Fine adjusting screw Clamp screw Vernier slide



Base Graduated beam Scriber Vernier plate

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 11. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 11.

VERNIER MEASURING TOOLS
UNIT V
LAP ASSIGNMENT SHEET #4--SELECT THE CORRECT VERNIER TOOL

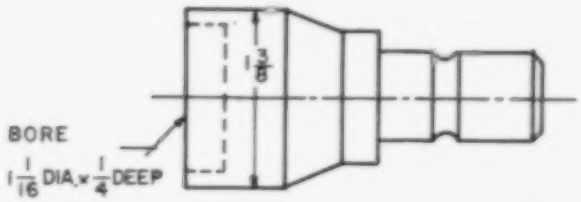
NAME _____ SCORE _____

DIRECTIONS: Select the type of vernier measuring tool you would use to determine the dimension shown on each drawing from the following list. Write the name of the tool you have selected in the space provided. Note that some tools may be used more than once.

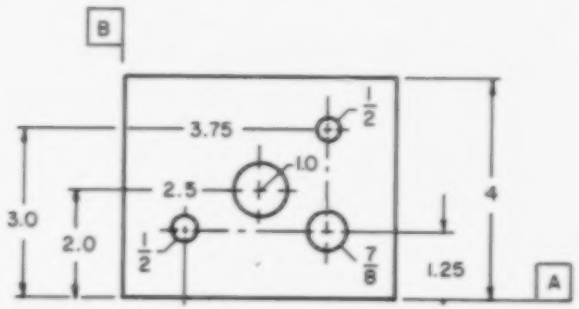
Vernier caliper	Vernier height gage
Universal bevel protractor	Vernier depth gage

1. Used to measure the length of a steel bar being machined to 4 1/32":
_____

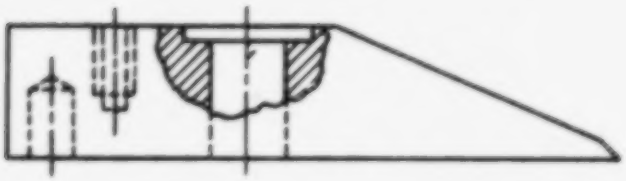
2. Used to measure this inside bore: _____



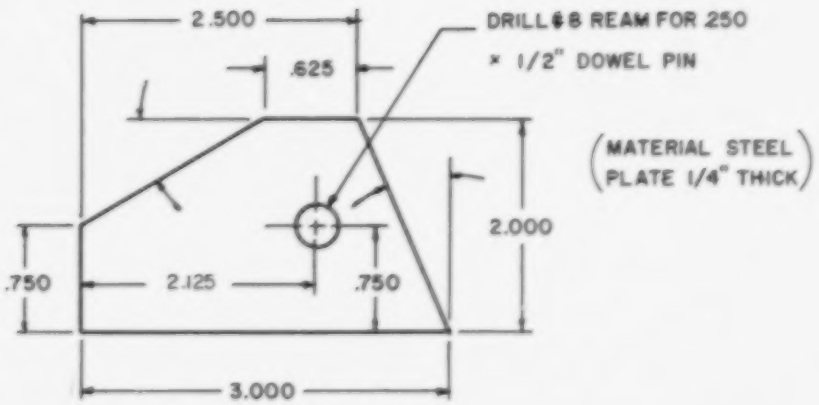
3. Used to lay out the location of these holes to be drilled: _____



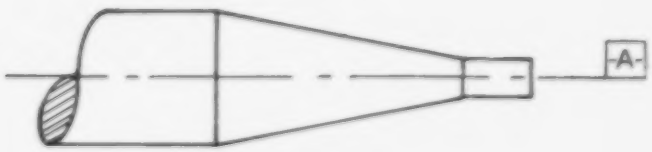
4. Used to lay out this angle: _____



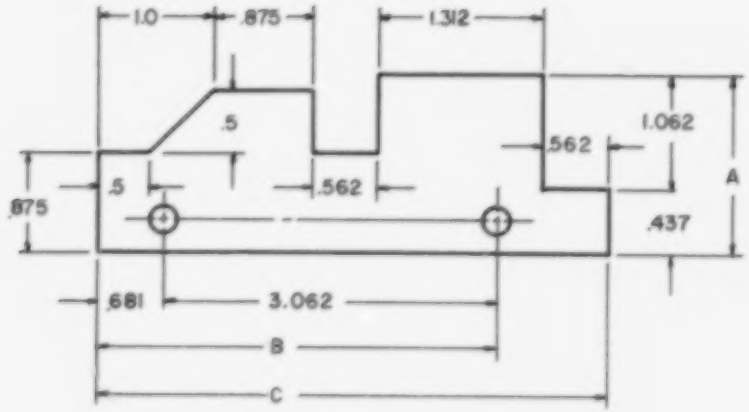
5. Used to measure the distance of this pin from its reference surface:
_____



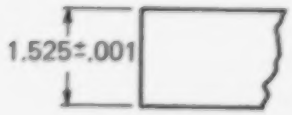
6. Used to measure the included angle of this part to datum A: _____



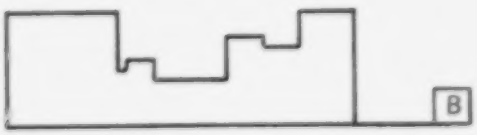
7. Used to measure the distance of the lowest part of the slot from the reference surface: _____



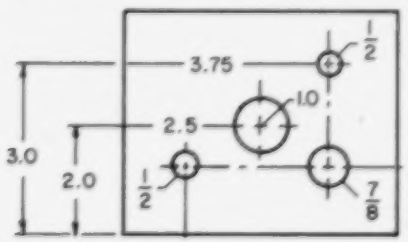
8. Used to measure the diameter of this part which is being turned to the given tolerance: _____



9. Used to measure the distance to each of the indicated surfaces from datum B: _____



10. Used to measure the diameter of these drilled holes: _____

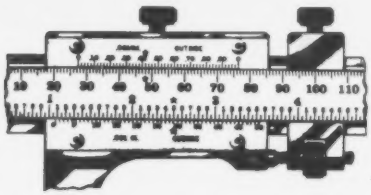


11. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 15. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 15.

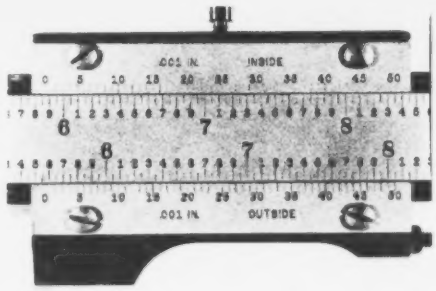
VERNIER MEASURING TOOLS
UNIT V
LAP ASSIGNMENT SHEET #5--READ THE VERNIER

NAME _____ SCORE _____

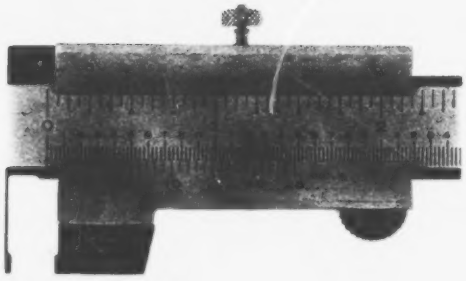
1. Read the measurements on these vernier tools and record your reading in the space provided. Be sure to include decimal points and degree and minute symbols when required.



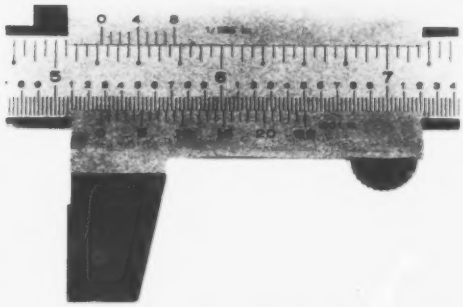
a. _____



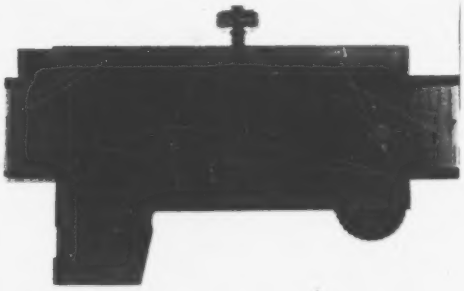
b. _____



c. _____



d. _____



e. _____

f. _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 19. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 19.

State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for MACHINE SHOP I

LAP NO._____ CODE:_____

MAJOR INSTRUCTIONAL AREA

BASIC AND RELATED TECHNOLOGY

INSTRUCTIONAL UNIT

DIAL INDICATORS
SECTION B--UNIT VI

LEARNING ACTIVITY PACKET NO.

8

PREREQUISITE LAP(S)

1, 3, 5

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities and performance tasks for "Dial Indicators." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training and in achieving a SKILLED or MODERATELY SKILLED competency level in the performance of jobs associated with this specialty.

INTRODUCTION: The course of study in this LAP will help the student become able to use dial indicators for alignment and referencing.

TASKS INCLUDED IN THIS LAP:

1. Align a vise.
2. Align work in a 4-jaw chuck with dial indicator.
3. Align work clamped to angle plate parallel to surface plate.
4. Align the head of ram and turret mill.
5. Reference the spindle to the solid jaw of a vise.
6. Use dial indicator to check hole locations.
7. Use dial indicator to center rotary table.
8. Use dial indicator to align tailstock of lathe.

MACHINE SHOP I
DIAL INDICATORS
SECTION B--UNIT VI

LEARNING STEPS

Check the Following
Blanks as You Complete
the Required Steps

_____1.	Read	Unit and Specific Objectives, page 337-B.
_____2.	Complete	Dial Indicators Pre-Test, LAP page 9.
_____3.	Study	The sections of the Information Sheet, pages 341-B through 351-B, indicated by your instructor on your Pre-Test. Be sure to refer to the Transparency Masters when required.
_____4.	Refer	To Step 5 of your Pre-Test. If additional study is indicated for any of Sections I, II, or IV, continue to Step 5. Otherwise, proceed to Step 7.
_____5.	Do	LAP Assignment Sheet #1, LAP page 13.
_____6.	Do	LAP Assignment Sheet #2, LAP page 17.
_____7.	Refer	To Step 5 of your Pre-Test. If additional study is indicated for Section III, continue to Step 8. Otherwise, proceed to Step 11.
_____8.	Do	Assignment Sheet #1--Select the Proper Indicator to Do Work Required, page 353-B.

_____9. Stop. Have your instructor evaluate Assignment Sheet #1. If your instructor is satisfied with your performance, proceed to Step 11. Otherwise, continue to Step 10.

_____10. Do LAP Assignment Sheet #3, LAP page 19.

_____11. Check The tasks below which you feel that you can perform without supervision.

Student Check		Instructor Initials/Date	
		Skilled	Moderately Skilled
_____a.	Align a vise (14).	_____	_____
_____b.	Align work in a 4-jaw chuck with dial indicator (20).	_____	_____
_____c.	Align work clamped to angle plate parallel to surface plate (26).	_____	_____
_____d.	Align head of a ram and turret mill (32).	_____	_____
_____e.	Reference the spindle to the solid jaw of a vise (38).	_____	_____
_____f.	Use dial indicator to check hole locations (44).	_____	_____
_____g.	Use dial indicator to center rotary table (50).	_____	_____
_____h.	Use dial indicator to align tailstock of lathe (56).	_____	_____

_____12. Discuss Your competency in each task with your instructor. Your instructor will initial each task in which you demonstrate sufficient competency. If all tasks have been initialed, proceed to Step 62. Otherwise, continue to Step 13.

_____13. Refer — To Step 11a. If this task has been initialed, proceed to Step 19. Otherwise, continue to Step 14.

_____14. Study — Job Sheet #1--Align a Vise, page 357-B.

_____15. Watch — Slide/tape presentation "Align a Vise" (B-VI-1).

_____16. Do — Job Sheet #1--Align a Vise.

_____17. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11a and proceed to Step 19. Otherwise, repeat Steps 14-16 and then go to Step 18.

_____18. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11a and continue to Step 19. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 11a and continue to Step 19.

_____19. Refer — To Step 11b. If this task has been initialed, proceed to Step 25. Otherwise, continue to Step 20.

_____20. Study — Job Sheet #2--Align Work in a 4-Jaw Chuck with Dial Indicator, page 361-B.

_____21. Watch — Slide/tape presentation "Align Work in a 4-Jaw Chuck with Dial Indicator" (B-VI-2).

_____22. Do — Job Sheet #2--Align Work in a 4-Jaw Chuck with Dial Indicator.

_____23. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11b and proceed to Step 25. Otherwise, repeat Steps 20-22 and then go to Step 24.

_____24. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11b and continue to Step 25. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 11b and continue to Step 25.

_____25. Refer To Step 11c. If this task has been initialed, proceed to Step 31. Otherwise, continue to Step 26.

_____26. Study Job Sheet #3--Align Work Clamped to Angle Plate Parallel to Surface Plate, page 367-B.

_____27. Watch Slide/tape presentation "Align Work Clamped to Angle Plate Parallel to Surface Plate" (B-VI-3).

_____28. Do Job Sheet #3--Align Work Clamped to Angle Plate Parallel to Surface Plate.

_____29. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11c and proceed to Step 31. Otherwise, repeat Steps 26-28 and then go to Step 30.

_____30. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11c and continue to Step 31. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 11c and continue to Step 31.

_____31. Refer — To Step 11d. If this task has been initialed, proceed to Step 37. Otherwise, continue to Step 32.

_____32. Study — Job Sheet #4--Align the Head of a Ram and Turret Mill, page 371-B.

_____33. Watch — Slide/tape presentation "Align the Head of a Ram and Turret Mill" (B-VI-4).

_____34. Do — Job Sheet #4--Align the Head of a Ram and Turret Mill.

_____35. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11d and proceed to Step 37. Otherwise, repeat Steps 32-34 and then go to Step 36.

_____36. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11d and continue to Step 37. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 11d and continue to Step 37.

_____37. Refer — To Step 11e. If this task has been initialed, proceed to Stpe 43. Otherwise, continue to Step 38.

_____38. Study — Job Sheet #5--Reference the Spindle to the Solid Jaw of a Vise, page 381-B.

_____39. Watch — Slide/tape presentation "Reference the Spindle to the Solid Jaw of a Vise" (B-VI-5).

_____40. Do — Job Sheet #5--Reference the Spindle to the Solid Jaw of a Vise.

_____41. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11e and proceed to Step 43. Otherwise, repeat Steps 38-40 and then go to Step 42.

_____42. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11e and continue to Step 43. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 11e and continue to Step 43.

_____43. Refer — To Step 11f. If this task has been initialed, proceed to Step 49. Otherwise, continue with Step 44.

_____44. Study — Job Sheet #6--Use Dial Indicator to Check Hole Locations, page 383-B.

_____45. Watch — Slide/tape presentation "Use Dial Indicator to Check Hole Locations." (B-VI-6).

_____46. Do — Job Sheet #6--Use Dial Indicator to Check Hole Locations.

_____47. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11f and proceed to Step 49. Otherwise, repeat Steps 44-46 and then go to Step 48.

_____48. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11f and continue to Step 49. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 11f and continue to Step 49.

_____49. Refer To Step 11g. If this task has been initialed, proceed to Step 55. Otherwise continue with Step 50.

_____50. Study Job Sheet #7--Use Dial Indicator to Center Rotary Table, page 389-B.

_____51. Watch Slide/tape presentation "Use Dial Indicator to Center Rotary Table" (B-VI-7).

_____52. Do Job Sheet #7--Use Dial Indicator to Center Rotary Table.

_____53. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11g and proceed to Step 55. Otherwise, repeat Steps 50-52 and then go to Step 54.

_____54. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11g and continue to Step 55. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Step 55.

_____55. Refer To Step 11h. If this task has been initialed, proceed to Step 61. Otherwise, continue to Step 56.

_____56. Study Job Sheet #8--Use Dial Indicator to Align Tailstock of Lathe, page 391-B.

_____57. Watch — Slide/tape presentation "Use Dial Indicator to Align Tailstock of Lathe" (B-VI-8).

_____58. Do — Job Sheet #8--Use Dial Indicator to Align Tailstock of Lathe.

_____59. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11h and proceed to Step 61. Otherwise, repeat Steps 56-58 and then go to Step 60.

_____60. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 11h and continue to Step 61. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 11h and continue to Step 61.

_____61. Refer — To Step 11. If all tasks have been initialed, continue to Step 62. Otherwise, refer to the step indicated in parentheses after the unsigned task.

_____62. Review — Information Sheet (page 341-B) and Assignment Sheet #1.

_____63. Take — Dial Indicators Unit VI Test (see your instructor). If your score is 85 percent or above, continue to the next Learning Activity Packet. If you do not score 85 percent or above, ask your instructor about additional study requirements and possible retesting.

DIAL INDICATORS
UNIT VI

PRE-TEST

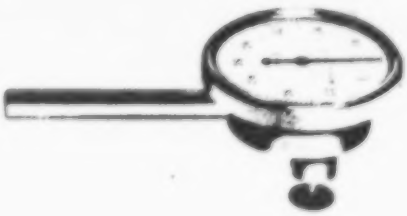
NAME_____ SCORE_____

DIRECTIONS: This test is to determine how much you already know about dial indicators. your performance on this test will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you know the answer. Guessing may prevent you from receiving the lessons which are required.

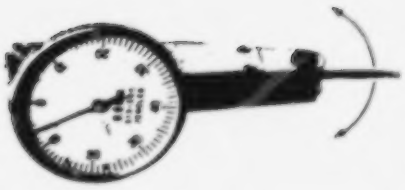
1. Match the terms on the right associated with dial indicators to their correct definitions by writing the number in the blank provided.

_____a.	Round surfaces which are true to each other	1. Dings
_____b.	The total amount of movement of a dial indicator plunger	2. Concentric
_____c.	To make a part or attachment true	3. Range
_____d.	The difference an indicator reading will be at its maximum and minimum points	4. Runout
_____e.	The amount of movement or misalignment of a part	5. Total indicator reading (TIR)
_____f.	Irregularities on a surface caused by abuse	6. Align

2. Identify the different types of indicators below.



a._____ b._____



c._____ d._____

e._____

3. Select the proper type of indicator to do the work required. Write the number of the proper tool in the space provided. Some tools may be used more than once, and more than one tool may be used to do the job described.

1. Dial test indicator.
2. Plunger back dial indicator.
3. Vertical plunger dial indicator.
4. Junior test indicator.

_____a. Used to check for concentrating on a part.

_____b. Used in small palces such as indicating on a hole or bore.

_____c. Used to align parts inside and outside when held in a lathe chuck when an accuracy of less than 0.002 inches tolerance is not required.

_____d. Used to align a vise.

_____e. Used to align a hole on a mill true to a spindle.

_____f. Used to align lathe tailstock, vertical head of mill, or work in lathe.

_____g. Used when learning to use a dial indicator.

_____h. Used for setting tapers.

_____i. Can be mounted to comparator, snap gages, thickness gages, or other fixtures for special applications.

_____j. Used to align the head of a ram and turret mill perpendicular to the table.

4. State the rules for the proper care of dial indicators by explaining how each of the following terms applies to the use and care of dial indicators.

a. Cleanliness -- _____

_____

_____

b. Vibration -- _____

_____

_____

c. Lubrication -- _____

_____

_____

d. Handling -- _____

_____

_____

e. Inspection -- _____

_____

_____

f. While work is turning -- _____

_____

_____

g. Revolving the indicator -- _____

_____

_____

h. Exceeding the range -- _____

_____

_____

5. Stop. Have your instructor evaluate your test and mark the areas below which require additional study.

   Refer to Information Sheet, Sections:

   I_____ III_____

   II_____ IV_____

   If any of the areas is marked, continue to LAP Step 3. Otherwise, proceed to LAP Step 11.

BASIC AND RELATED TECHNOLOGY
UNIT VI
LAP ASSIGNMENT SHEET #1--DIAL INDICATORS

NAME_____ SCORE_____

1. Match these terms associated with dial indicators by selecting the correct definitions from the choices provided.

   1. Align:

      _____a. The total amount of movement of a dial indicator plunger.

      _____b. To make a part or attachment true.

      _____c. The amount of movement or misalignment of a part.

   2. Total indicator reading (TIR):

      _____a. The total amount of movement of a dial indicator plunger.

      _____b. The difference an indicator reading will be at its maximum and minimum points.

      _____c. The amount of movement or misalignment of a part.

   3. Range:

      _____a. The total amount of movement of a dial indicator plunger.

      _____b. The difference an indicator reading will be at its maximum and minimum points.

      _____c. The amount of movement or misalignment of a part.

   4. Dings:

      _____a. Round surfaces which are true to each other.

      _____b. To make a part or attachment true.

      _____c. Irregularities on a surface caused by abuse.

   5. Concentric:

      _____a. Round surfaces which are true to each other.

      _____b. To make a part or attachment true.

      _____c. The amount of movement or misalignment of a part.

6. Runout:

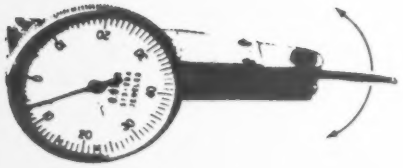
_____a. Round surfaces which are true to each other.

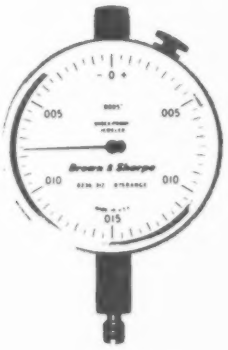
_____b. The amount of movement or misalignment of a part.

_____c. Irregularities on a surface caused by abuse.

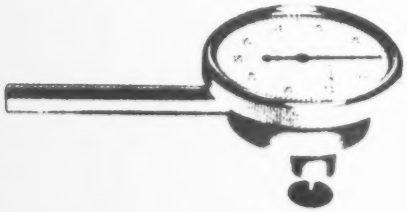
2. Identify the different types of indicators by writing the correct names in the blanks provided.

Vertical plunger dial indicator
Junior test indicator
Dial test indicator
Plunger back dial indicator





a. _____ b. _____



c. _____ d. _____

4. State the rules for proper care of dial indicators by completing the following statements.

   a. Cleanliness -- Keep the indicator stored in a box free of _____ and _____; otherwise, the spindle has a tendency to stick, giving you a bad reading.

   b. Vibration -- Do not hammer on objects with indicator _____ in contact with work or you can damage the indicator.

   c. Lubrication -- Never lubricate dial indicators; this causes them to become _____.

   d. Handling -- Always handle dial indicators with _____ and check the secureness of each setup so that the indicator will not _____.

   e. Inspection -- Inspect the indicator by mounting it on a _____ stand and using a gage block to see if the _____ moves the correct amount.

   f. While the work is turning -- It is not a good practice to use _____ power to turn a work while the indicator point is in contact with the work; this causes a _____ on the point of the indicator.

   g. Revolving the indicator -- Use _____ power, never machine power, to revolve the indicator.

   h. Exceeding the range -- Never exceed the range of the indicator because this will _____ it.

3. Stop. Have your instructor evaluate your Assignment Sheet and mark the areas below which require additional study.

   Refer to Information Sheet, Sections:

   I_____

   II_____

   IV_____

   If any of the above study areas is checked, study the required section(s) of the Information Sheet, and continue to LAP Step 6. Otherwise, proceed to LAP Step 7.

BASIC AND RELATED TECHNOLOGY
UNIT VI

LAP ASSIGNMENT SHEET #2--DIAL INDICATORS

NAME_____ SCORE_____

1. Match the terms associated with dial indicators on the right to their correct definition by writing the number in the proper blank.

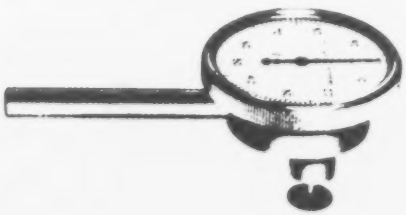
_____a.	Round surfaces which are true to each other	1. Total indicator reading (TIR)
_____b.	The total amount of movement of a dial indicator plunger	2. Concentric
_____c.	To make a part or attachment true	3. Range
_____d.	The difference an indicator reading will be at its maximum and minimum points	4. Dings
_____e.	The amount of movement or misalignment of a part	5. Align
_____f.	Irregularities on a surface caused by abuse	6. Runout

2. Identify the different types of indicators by writing the correct names in the blanks provided.

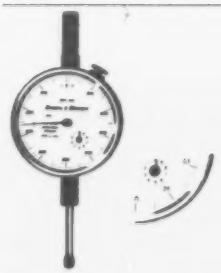
Dial test indicator
Vertical plunger indicator with revolution counter
Junior test indicator
Plunger back dial indicator

a. _____

b. _____



c. _____



d. _____

3. State the rules for proper care of dial indicators by completing the following statements.

   a. Cleanliness -- Keep the indicator stored in a _____ free of _____ and _____; otherwise, the _____ has a tendency to _____, giving you a bad reading.

   b. Vibration -- Do not _____ on objects with the _____ _____ in contact with the work or you can _____ the indicator.

   c. Lubricate -- Always/Never lubricate dial indicators; this causes them to become sluggish. (Cross out the incorrect answer.)

   d. Handling -- Always handle dial indicators with _____ and check the _____ of each _____ so the indicator will not fall.

   e. Inspection -- Inspect the indicator by _____ it on a _____ _____ and using a _____ _____ to see if the _____ moves the correct amount.

   f. While work is turning -- It is not a good practice to use _____ power to turn a work while the indicator _____ is in contact with the work; this causes a flat on the _____ of the indicator.

   g. Revolving the indicator -- Use _____ power, never _____ power, to revolve the indicator.

   h. Exceeding the range -- Always/Never exceed the range of the indicator. (Cross out the incorrect answer.)

4. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 7. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 7.

DIAL INDICATORS
UNIT VI
LAP ASSIGNMENT SHEET #3--SELECT THE PROPER INDICATOR TO DO WORK REQUIRED

NAME_____ SCORE_____

1. Select the proper indicator to do the job by telling whether the following statements are true or false. Although it may be possible to devise a way of doing the job with the indicator named, if the indicator named is not the best choice for the job, you should consider the statement to be false. Put a "T" for true statements and an "F" for false statements.

   _____a. Use a vertical plunger dial indicator to check the setting of a taper attachment.

   _____b. Use a plunger back dial indcator to check a hole location.

   _____c. Use a junior test indicator to align the spindle of a milling machine true to the center of a rotary table.

   _____d. Use a dial test indicator to align parts when you are learning to use indicators.

   _____e. Use a plunger back dial indicator to align or sweep the head of a ram and turret milling machine in true to the table.

   _____f. Use a dial test indicator to indicate the inside diameter of a part chucked in a lathe.

   _____g. Use a vertical plunger dial to align a vise mounted on a milling machine table.

   _____h. Use a dial test indicator to inspect parts when mounted on a height gage.

   _____i. Use a plunger back dial indicator to align work chucked in a 4-jaw chuck true to the spindle of the lathe.

   _____j. Use a dial test indicator to align a tailstock of a lathe true to the headstock.

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 11. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 11.

State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for MACHINE SHOP I

LAP NO. _____ CODE: _____

MAJOR INSTRUCTIONAL AREA

BASIC AND RELATED TECHNOLOGY

INSTRUCTIONAL UNIT

GAGING AND INSPECTION TOOLS
SECTION B--UNIT VII

LEARNING ACTIVITY PACKET NO.

9

PREREQUISITE LAP(S)

1, 3, 5

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities and performance tasks for "Gaging and Inspection Tools." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training and in achieving a SKILLED or MODERATELY SKILLED competency level in the performance of jobs associated with this specialty.

INTRODUCTION: The course of study in this LAP will help the student become able to use precision gages and inspection tools.

TASKS INCLUDED IN THIS LAP:

1. Use gage blocks.
2. Use sine bar to set angle.

MACHINE SHOP I
GAGING AND INSPECTION TOOLS
SECTION B--UNIT VII

LEARNING STEPS

Check the Following
Blanks as You Complete
the Required Steps.

_____1.	Read	Unit and Specific Objectives, page 399-B.
_____2.	Complete	Gaging and Inspection Tools Pre-Test, LAP page 5.
_____3.	Study	The sections of the Information Sheet, pages 403-B through 419-B, indicated by your instructor on your Pre-Test.
_____4.	Refer	To Step 9 of your Pre-Test. If additional study is indicated for any of Sections I, II, III, IV, V or VII, continue to Step 5. Otherwise, proceed to Step 7.
_____5.	Do	LAP Assignment Sheet #1, LAP page 19.
_____6.	Do	LAP Assignment Sheet #2, LAP page 33.
_____7.	Refer	To Step 9 of your Pre-Test. If additional study is indicated for Section VII, continue to Step 8. Otherwise, proceed to Step 11.
_____8.	Do	Assignment Sheet #1--Calculate Gage Blocks, page 421-B.
_____9.	Stop.	Have your instructor evaluate Assignment Sheet #1. If your instructor is satisfied with your performance, proceed to Step 11. Otherwise, continue to Step 10.

_____10. Do — LAP Assignment Sheet #3, LAP page 43.

_____11. Refer — To Step 9 of your Pre-Test. If additional study is indicated for Section VIII, continue to Step 12. Otherwise, proceed to Step 15.

_____12. Do — Assignment Sheet #2--Use Trigonometric Function Tables to Calculate Sine Bar Elevation, page 423-B.

_____13. Stop. — Have your instructor evaluate Assignment Sheet #2. If your instructor is satisfied with your performance, proceed to Step 15. Otherwise, continue with Step 14.

_____14. Do — LAP Assignment Sheet #4, LAP page 45.

_____15. Check — The tasks below which you feel that you can perform without supervision.

Student Check		Instructor Initials/Date	
		Skilled	Moderately Skilled
_____a.	Use gage blocks (18).	_____	_____
_____b.	Use sine bar to set angle (24).	_____	_____

_____16. Discuss — Your competency in each task with your instructor. Your instructor will initial each task in which you demonstrate sufficient competency. If all tasks have been initialed, proceed to Step 30. Otherwise, continue to Step 17.

_____17. Refer — To Step 15a. If this task has been initialed, proceed to Step 22. Otherwise, continue to Step 18.

_____18. Study Job Sheet #1--Use Gage Blocks, page 427-B.

_____19. Watch Slide/tape presentation "Use Gage Blocks" (B-VII-1).

_____20. Do Job Sheet #1--Use Gage Blocks

_____21. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15a and proceed to Step 23. Otherwise, repeat Steps 18-20 and then go to Step 22.

_____22. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15a and continue to Step 23. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 15a and continue to Step 23.

_____23. Refer To Step 15b. If this task has been initialed, proceed to Step 29. Otherwise, continue to Step 24.

_____24. Study Job Sheet #2--Use Sine Bar to Set Angle, page 431-B.

_____25. Watch Slide/tape presentation "Use Sine Bar to Set Angle" (B-VII-2).

_____26. Do Job Sheet #2--Use Sine Bar to Set Angle.

_____27. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15b and proceed to Step 29. Otherwise, repeat Steps 24-26 and then go to Step 28.

_____28. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 15b and continue to Step 29. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 15b and continue to Step 29.

_____29. Refer To Step 15. If all tasks have been initialed, continue to Step 30. Otherwise, refer to the step indicated in parentheses after the unsigned task.

_____30. Review Information Sheet (page 403-B) and Assignment Sheets 1 and 2.

_____31. Take Gaging and Inspection Tools Unit VII Test (see your instructor). If your score is 85 percent or above, continue to the next Learning Activity Packet. If you do not score 85 percent or above, ask your instructor about additional study requirements and possible re-testing.

GAGING AND INSPECTION TOOLS
UNIT VII

PRE-TEST

NAME _____ SCORE _____

DIRECTIONS: This test is to determine how much you already know about gaging and inspection tools. Your performance on this test will not be used to determine your grade in this course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you know the answer. Guessing may prevent you from receiving the lessons which are required.

1. Match the terms on the right associated with gaging and inspection tools to the correct definitions by writing the number of the term in the blank provided by the proper definition.

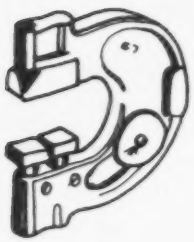
_____a.	Refers to the upper and lower limits of a part when used in conjunction with a gage	1. Round
_____b.	All diameters have a common center	2. Concentricity
_____c.	A set unit of measurement for checking precision measuring tools	3. Parallelism
_____d.	All parts on the controlled surface must lie within the tolerance zone, which is parallel to a particular surface	4. "Go" and "no-go"
_____e.	The diameter of an imaginary cylinder which passes through the threads at a point where the groove and thread widths are equal	5. Pitch diameter
_____f.	To convey a measurement from one place to another	6. Pitch
_____g.	A convex surface on the edge of a part	7. Fillet
_____h.	Distance from any point on the thread of a screw to a corresponding part on an adjacent thread, measured parallel to the axis	8. Transfer
_____i.	Concave junction formed where two surfaces meet	9. Standard

2. Identify the gages illustrated on the following pages by choosing the correct name from the list and writing it in the blank provided.

Center gage	Dial bore gage
Screw pitch gages	Dial depth gage

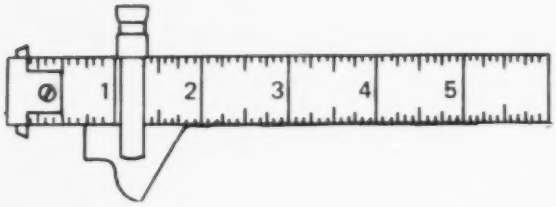
Radius gages
Telescoping gages
Small hole gages
Dial thickness gage
Snap gage
Ring gages
Fractional drill gage
Steel wire gage

Thread ring gages
Cylindrical plug gage
Thread plug gage
Drill point gage
Surface finish gage
Letter drill gage
Number drill gage

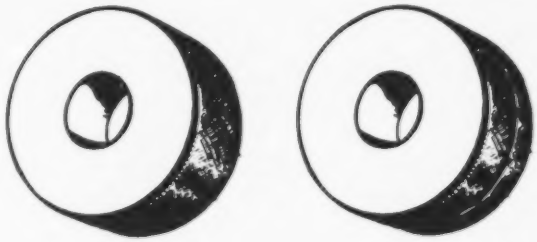


a. _____

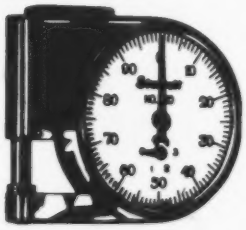
b. _____



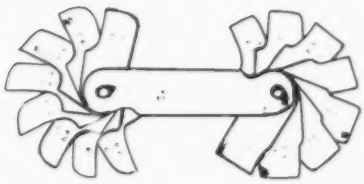
c. _____



d. _____



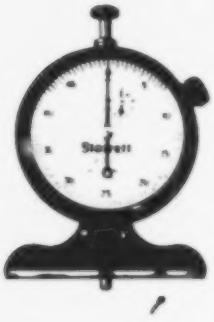
e. _____



f. _____

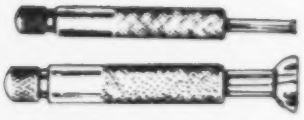
g. _____

h. _____

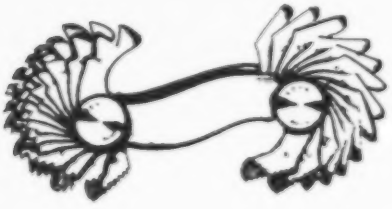


i. _____

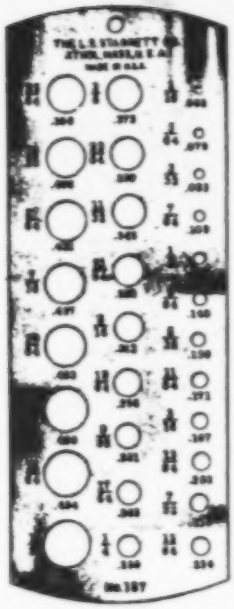
j. _____



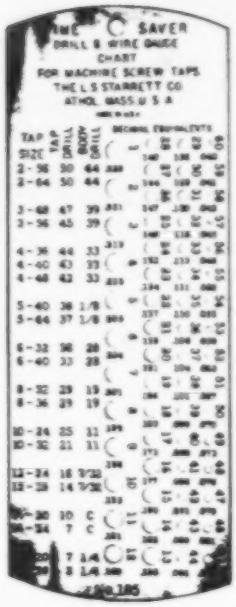
k. _____



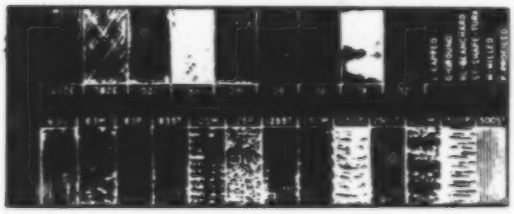
l. _____



m. _____


SAVER
DRILL & WIRE GAUGE
CHART
FOR MACHINE SCREW TAPS
THE L S STARRETT CO
ATHOL MASS U S A

n. _____

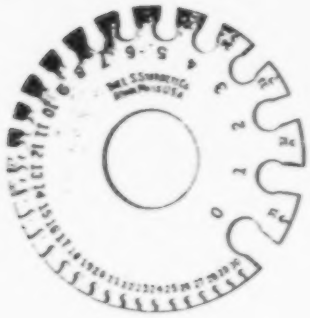


o. _____

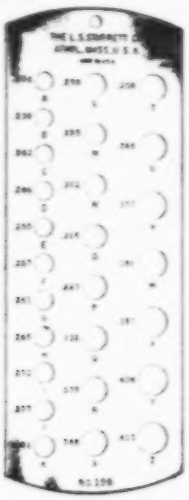
p. _____

GO
HI

q. _____



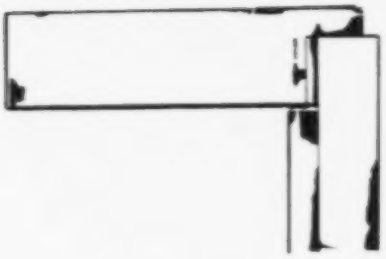
r. _____



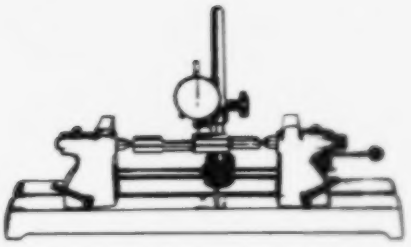
s. _____ t. _____

3. Identify the inspection tools shown in the following illustrations by selecting the correct name from the list below and writing it in the blank provided.

Cylindrical square
Electronic comparator
Height micrometer
Comparator (transfer stand with indicator)
Sine bar
Gage blocks (Johannson or Jo blocks)
Pressure type air gage
Optical comparator
Bench center
Optical flat
Bevel edge steel square



a. _____



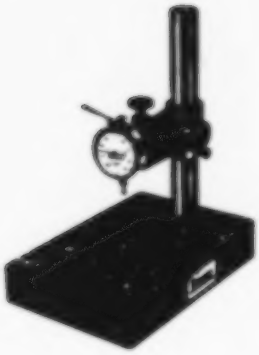
b. _____

c. _____

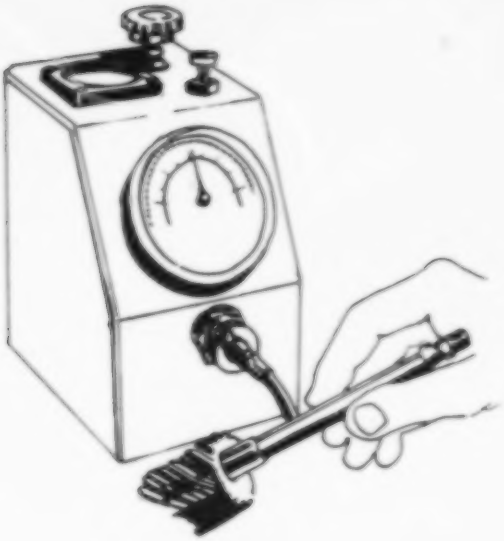
d. _____

e. _____

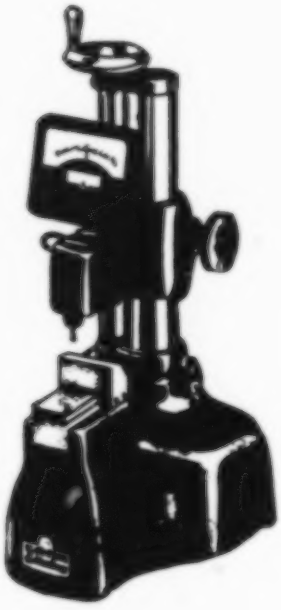
f. _____



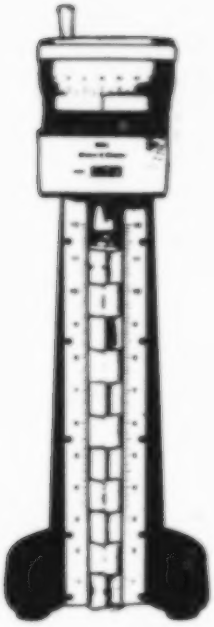
g. _____



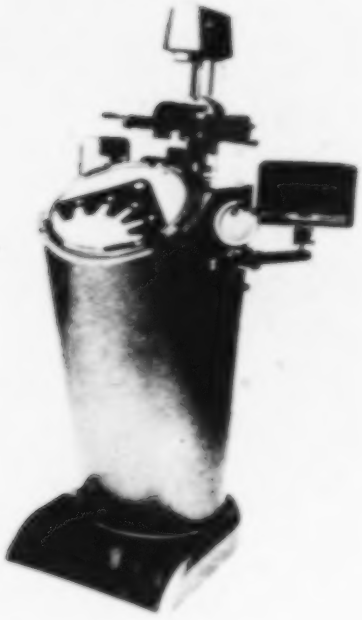
h. _____



i. _____



j. _____



k. _____

4. Describe rules for the care of gaging and inspection tools in the blanks below by explaining how each term applies to the care of gaging and inspection tools.

a. Storage -- _____

_____

_____

b. Handling -- _____

_____

_____

c. Cleaning -- _____

_____

_____

d. Inspecting -- _____

_____

_____

e. Lubricating -- _____

_____

_____

5. Match the gaging tools listed on the right to their correct uses by writing the number of the tool in the blank beside its proper use. Uses continue on next page.

_____a. Used to check 60° threading tool when grinding to shape, to set threading tool when cutting threads, and to check centers

_____b. Used as a fast method of checking the thickness of sheet material

_____c. Used to measure small holes, slots, and grooves by transferring measurements to an outside micrometer; range is 1/8" to 1/2"

_____d. Used to check the bore of parts to .0001" accuracy; must be present with a ring gage

_____e. Has "go" and "no-go" ends; used to check bore of parts to .0001" accuracy

_____f. Used to check the depth of holes, slots, grooves, and recesses

_____g. Used to visually compare the desired finish of a part to a certain known finish

_____h. Used to determine the pitch or number of threads per inch of a threaded part

_____i. Used to check parts within certain limits of a predetermined, fixed dimension

_____j. Used to measure holes, slots, and recesses by transferring measurements to outside micrometer; range is 5/16" to 6"

_____k. Has "go" and "no-go" threaded ends; used to check pitch diameter of internal threads

1. Screw pitch gage
2. Thread ring gage
3. Ring gage
4. Thread plug gage
5. Telescoping gage
6. Radius gage
7. Drill point gage
8. Snap gages
9. Drill and steel wire gage
10. Surface finish gage
11. Center gage
12. Cylindrical plug gage
13. Dial bore gage
14. Dial thickness gage
15. Dial depth gage
16. Small hole gage

_____l. Used to check a radius or fillet

_____m. Used to check size of drills and steel wire

_____n. Used to check the pitch diameter of a threaded part

_____o. Used when drill grinding to determine the correct drill point angle

_____p. Used to set, check tools, and measure parts to .0001" accuracy

6. Match the inspection tools listed on the right to their correct uses by writing the number of the tool in the blank provided beside its proper use.

_____a. Used to check measurements, set fixed gages, calibrate measuring tools, set comparators, inspect, and perform other set-ups

_____b. Used as a visual method of inspection

_____c. Used as a master square against which other squares may be checked

_____d. Used to inspect size of parts from a flat surface

_____e. Used for inspection of parts to a very close tolerance with air flow

_____f. Used to inspect parts for squareness

_____g. Used to check concentricity of machined parts

_____h. Used in inspection of parts; is preset and measures in the millionths of an inch (.000001)

_____i. Uses light waves to measure flatness, parallelism, and size

_____j. Used to set up or inspect angular surfaces of 45° or less

_____k. Used to set other measuring tools for inspection by comparison; accurate to .0001 of an inch

1. Optical comparator
2. Pressure type air gage
3. Electronic comparator
4. Height micrometer
5. Comparator
6. Bench center
7. Sine bar
8. Gage blocks
9. Optical flat
10. Bevel edge steel square
11. Cylindrical square

7. Select the gage blocks required for the two settings below from the gage block set list. Use the fewest number of blocks that you can and write your answers in the blanks provided.

FIRST: .0001 Series -- 9 Blocks

.1001	.1002	.1003	.1004	.1005	.1006	.1007	.1008	.1009

SECOND: .001 Series -- 49 Blocks

.101	.102	.103	.104	.105	.106	.107	.108	.109
.110	.111	.112	.113	.114	.115	.116	.117	.118
.119	.120	.121	.122	.123	.124	.125	.126	.127
.128	.129	.130	.131	.132	.133	.134	.135	.136
.137	.138	.139	.140	.141	.142	.143	.144	.145
.146	.147	.148	.149					

THIRD: .050 Series -- 19 Blocks

.050	.100	.150	.200	.250	.300	.350	.400	.450	.500
.550	.600	.650	.700	.750	.800	.850	.900	.950	

FOURTH: 1.000 Series -- 4 Blocks

1.000	2.000	3.000	4.000

TWO .050 WEAR BLOCKS

a. 2.6617

b. 1.8403

8. Use the trigonometric function tables provided to calculate the sine bar elevation for the angle listed using a 5" sine bar. Show all your calculations in the space provided and write your answer in the blank.

a. 31° 14' Answer _____

b. 9° 58' Answer _____

c. 24° 0' Answer _____

9. Stop. Have your instructor evaluate your Pre-Test and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I_____ VI_____

II_____ VII_____

III_____ VIII_____

IV_____ IX_____

V_____

If any of the above study areas is checked, continue to LAP Step 3. Otherwise, proceed to LAP Step 15.

BASIC AND RELATED TECHNOLOGY
UNIT VII

LAP ASSIGNMENT SHEET #1--GAGING AND INSPECTION TOOLS

NAME_____ SCORE_____

1. Match these terms associated with gaging and inspection tools to the correct definitions by selecting the definition from the choices provided.

   1. Round:

      _____a. All diameters have a common center

      _____b. A convex surface on the edge of a part

      _____c. Concave junction formed where two surfaces meet

   2. Concentricity:

      _____a. Refers to the upper and lower limits of a part when used in conjunction with a gage.

      _____b. All diameters have a common center.

      _____c. A set unit of measurement for checking precision measuring tools.

   3. Parallelism:

      _____a. All diameters have a common center.

      _____b. All parts on the controlled surface must lie within the tolerance zone, which is parallel to a particular surface.

      _____c. Distance from any point on the thread of a screw to a corresponding part on an adjacent thread, measured parallel to the axis.

   4. "Go" and "no-go":

      _____a. Refers to the upper and lower limits of a part when used in conjunction with a gage.

      _____b. A set unit of measurement for checking precision measuring tools.

      _____c. To convey a measure.

5. Pitch diameter:

_____a. All diameters have a common center.

_____b. The diameter of an imaginary cylinder which passes through the threads at a point where the groove and thread widths are equal.

_____c. A convex surface on the edge of a part.

6. Pitch:

_____a. All parts on the controlled surface must lie within the tolerance zone, which is parallel to a particular surface.

_____b. The diameter of an imaginary cylinder which passes through the threads at a point where the groove and thread widths are equal.

_____c. Distance from any point on the thread of a screw to a corresponding part on an adjacent thread, measured parallel to the axis.

7. Fillet:

_____a. A set unit of measurement for checking precision measuring tools.

_____b. A convex surface on the edge of a part.

_____c. Concave junction formed where two surfaces meet.

8. Transfer:

_____a. Refers to the upper and lower limits of a part when used in conjunction with a gage.

_____b. To convey a measurement from one place to another.

_____c. The diameter of an imaginary cylinder which passes through the threads at a point where the groove and thread widths are equal.

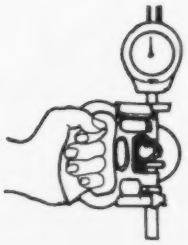
9. Standard:

_____a. A set unit of measurement for checking precision measuring tools.

_____b. All parts on the controlled surface must lie within the tolerance zone, which is parallel to a particular surface.

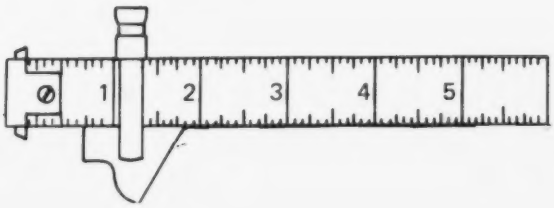
_____c. To convey a measurement from one place to another.

2. Identify the gages illustrated below and on the following pages by completing the name under the illustration.

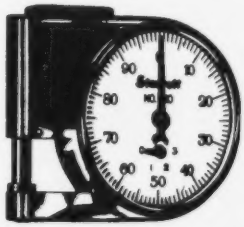


a. S_____ G_____

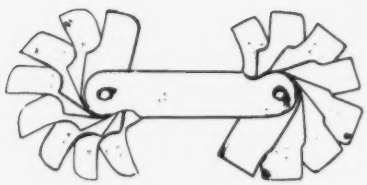
b. T_____ R_____ G_____



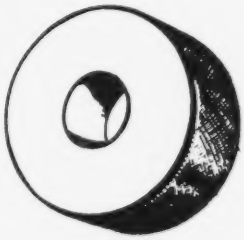
c. D_____ P_____ G_____



d. D_____ T_____ G_____

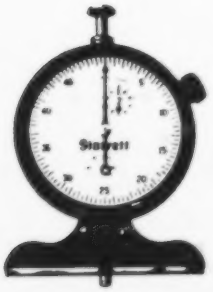


e. R_____ G_____



f. R_____ G_____

g. S_____ P_____ G_____

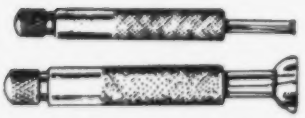


h. D_____ D_____ G_____

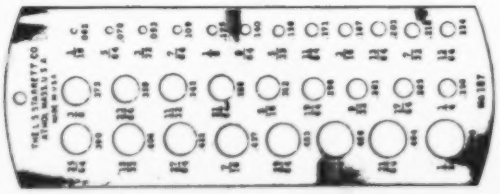
i. T_____ G_____

j. C_____ G_____

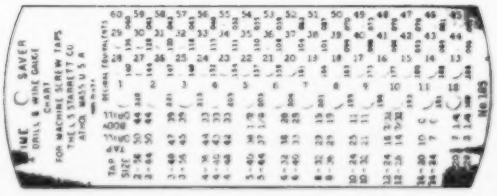
k. C_____ P_____ G_____



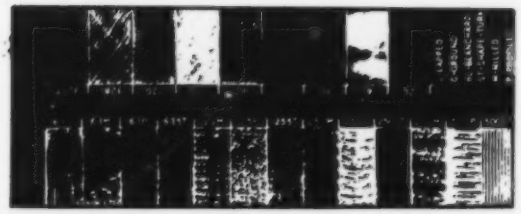
l. S_____ H_____ G_____



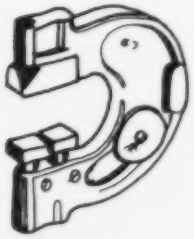
m. F_____ D_____ G_____



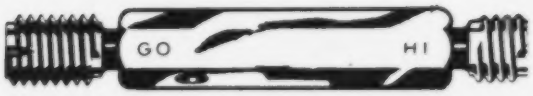
n. N_____ D_____ G_____



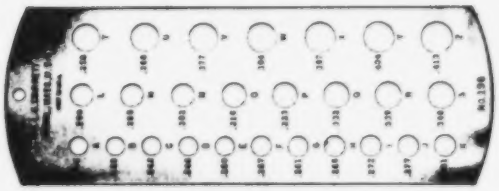
o. S_____ F_____ G_____



p. S_____ G_____



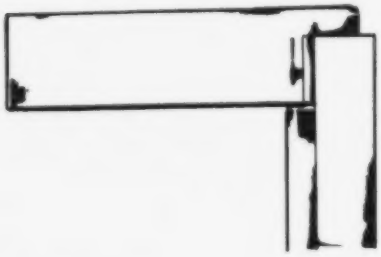
q. T_____ P_____ G_____



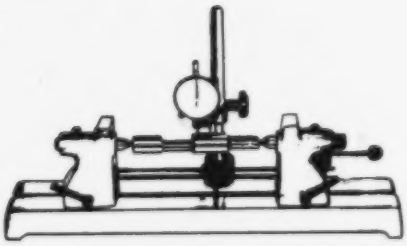
r. L_____ D_____ G_____

s. D_____ B_____ G_____ t. S_____ W_____ G_____

3. Identify the inspection tools shown in the following illustrations by completing the name under each tool.

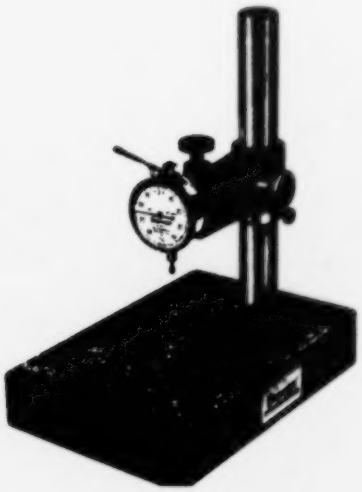


a. B_____ E_____ S_____ S_____ b. S_____ B_____



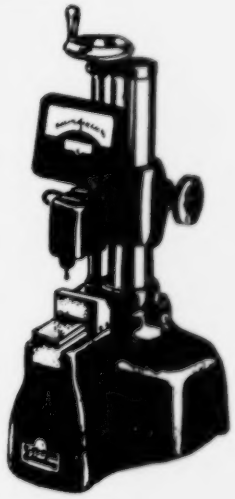
c. B_____ C_____ d. O_____ F_____

e. G_____ b_____

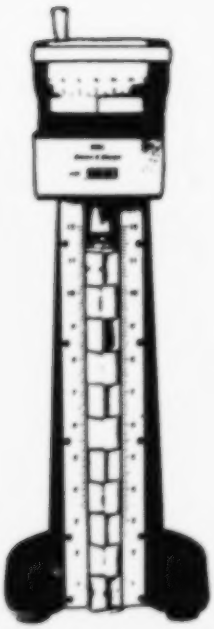


f. C_____

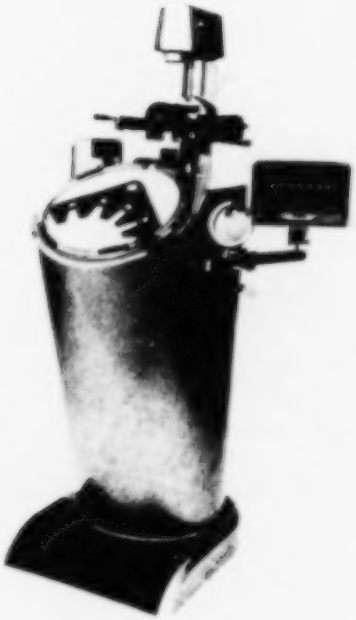
g. C_____ S_____



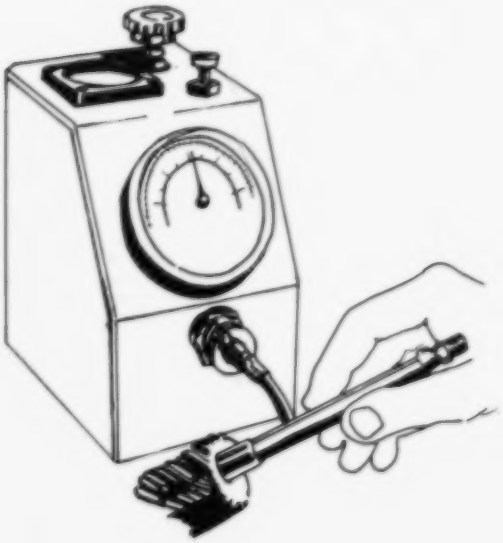
h. E_____ C_____



i. H_____ M_____



j. O_____ C_____



k. P_____ T_____ A_____ G_____

4. Describe rules for the care of gaging and inspection tools by completing these statements.

   a. Storage -- When you are finished using the tools, put them up back in their box or cover with a _____ _____

   b. Handling -- Always handle precision tools with _____; never throw them around or lay _____ on them

c. Cleaning -- Wipe the tools with a _____ _____ after using them

d. Inspecting -- Before using most gages and inspection tools, check them against a _____ to be sure of their accuracy

e. Lubricating -- Never lubricate the _____ of indicators; however, other metal parts should be lubricated with a thin coat of oil to prevent _____

5. Match gaging tools to their uses by selecting the correct choice.

1. Screw pitch gage:

_____a. Used to check 60° threading tool when grinding to shape, to set threading tool when cutting threads, and to check centers

_____b. Used to determine the pitch or number of threads per inch of a threaded part

_____c. Has "go" and "no-go" threaded ends; used to check pitch diameter of internal threads

2. Thread ring gage:

_____a. Used to check the bore of parts to .0001" accuracy; must be preset with a ring gage

_____b. Used to determine the pitch or number of threads per inch of a threaded part

_____c. Used to check the pitch diameter of a threaded part

3. Ring gage:

_____a. Used to check parts within certain limits of a predetermined, fixed dimension

_____b. Used to check the size of drills and steel wire

_____c. Used to set and check tools and measure parts to .0001" accuracy

4. Thread plug gage:

_____a. Used to check 60° threading tool when grinding a shape, to set threading tool when cutting threads, and to check centers

_____b. Has "go" and "no-go" threaded ends; used to check pitch diameter of internal threads

_____c. Used to check the pitch diameter of a threaded part

5. Telescoping gage:

_____a. Used to measure small holes, slots, and grooves by transferring measurements to an outside micrometer; range is 1/8" to 1/2"

_____b. Used to check the bore of parts to .0001" accuracy; must be preset with a ring gage

_____c. Used to measure holes, slots, and recesses by transferring measurements to an outside micrometer; range is 5/16" to 6"

6. Radius gage:

_____a. Has "go" and "no-go" ends; used to check bore parts to .0001" accuracy

_____b. Used to check a radius or fillet

_____c. Used to check the pitch diameter of a threaded part

7. Drill point gage:

_____a. Used when drill grinding to determine the correct drill point angle

_____b. Used to check size of drill and steel wire

_____c. Used to check the depth of holes, slots, grooves, and recesses

8. Snap gages:

_____a. Used to check the bore of parts to .0001" accuracy; must be preset with a ring gage

_____b. Used to check parts within certain limits of a predetermined, fixed dimension

_____c. Used to set and check tools and to measure parts to .0001" accuracy

9. Drill and steel wire gage:

_____a. Used to check size of drills and steel wire

_____b. Used when drill grinding to determine the correct drill point angle

_____c. Used to visually compare the desired finish of a part to a certain known finish.

10. Surface finish gage:

_____a. Used as a fast method for checking the thickness of sheet materials

_____b. Used to visually compare the desired finish of a part to a certain known finish

_____c. Used to check a radius or fillet

11. Center gage:

_____a. Used to check 60° threading tool when grinding a shape, to set threading tool when cutting threads, and to check centers

_____b. Used to check a radius or fillet

_____c. Used to check size of drill and steel wire

12. Cylindrical plug gage:

_____a. Used to measure small holes, slots, and grooves by transferring measurements to an outside micrometer; range is 1/8" to 4 1/2"

_____b. Has "go" and "no-go" ends; used to check bore of parts to .0001" accuracy

_____c. Has "go" and "no-go" ends; used to check pitch diameter of internal threads

13. Dial bore gage:

_____a. Used to check the bore of parts to .0001" accuracy; must be preset with a ring gage

_____b. Used to check the depth of holes, slots, grooves, and recesses

_____c. Used to measure holes, slots, and recesses by transferring measurements to an outside micrometer; range is 5/16" to 6"

14. Dial thickness gage:

_____a. Used as a fast method for checking the thickness of sheet material

_____b. Used to check parts within certain limits of a predetermined, fixed dimension

_____c. Used to check size of drills and steel wire

15. Dial depth gage:

_____a. Used to measure small holes, slots, and grooves by transferring measurements to an outside micrometer; range is 1/8" to 1/2"

_____b. Used to check the depth of holes, slots, grooves, and recesses

_____c. Used to set and check tools and measure parts to .0001" accuracy

16. Small hole gage:

_____a. Used to measure small holes, slots, and grooves by transferring measurements to an outside micrometer; range is 1/8" to 1/2"

_____b. Has "go" and "no-go" ends; used to check bore of parts to .0001" accuracy

_____c. Used to measure holes, slots, and recesses by transferring measurements to an outside micrometer; range is 5/16" to 6"

6. Match these gaging tools to their correct uses by selecting the gaging tool you would use to perform the job listed.

1. Check measurements, set fixed gages, calibrate measuring tools, set comparators, inspect, and perform other set-ups.

_____a. Gage blocks
_____b. Electronic comparator
_____c. Optical comparator

2. To perform a visual inspection

_____a. Optical flat
_____b. Bench center
_____c. Optical comparator

3. Check other squares against a master square

_____a. Cylindrical square
_____b. Bevel edge steel square
_____c. Sine bar

4. Inspect size of parts from a flat surface

_____a. Optical flat
_____b. Comparator
_____c. Height micrometer

5. Inspect parts to a very close tolerance with air flows

_____a. Bench center
_____b. Electronic comparator
_____c. Pressure type air gage

6. Inspect parts for squareness:

_____a. Cylindrical square
_____b. Bevel edge steel square
_____c. Sine bar

7. Check concentricity of machined parts:

_____a. Cylindrical square
_____b. Gage blocks
_____c. Bench center

8. Inspect parts in millionths (.000001) of an inch:

_____a. Height micrometer
_____b. Electronic comparator
_____c. Optical comparator

9. Measure flatness, parallelism, and size with light waves:

_____a. Optical flat
_____b. Height micrometer
_____c. Optical comparator

10. Set or inspect angular surfaces of 45° or less:

_____a. Bevel edge steel square
_____b. Sine bar
_____c. Pressure type air gage

11. Set other measuring tools for inspection by comparison with .0001 of an inch accuracy:

_____a. Gage blocks
_____b. Bench center
_____c. Height micrometer

7. Stop. Have your instructor evaluate your Assignment Sheet and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I_____ IV_____

II_____ V_____

III_____ VI_____

If any of the above study areas is checked, review the required section(s) of the Information Sheet and then go to LAP Step 6. Otherwise, proceed to LAP Step 7.

BASIC AND RELATED TECHNOLOGY
UNIT VII

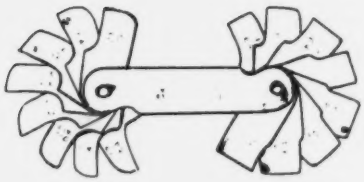
LAP ASSIGNMENT SHEET #2--GAGING AND INSPECTION TOOLS

NAME_____ SCORE_____

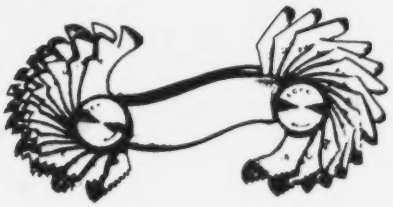
1. Match the terms on the right associated with gaging and inspection tools to their correct definitions by writing the number of the term in the blank provided.

_____a.	Refers to the upper and lower limits of a part when used in conjunction with a gage	1.	"Go" and "no-go"
_____b.	All diameters have a common center	2.	Pitch diameter
_____c.	A set unit of measurement for checking precision measuring tools	3.	Standard
_____d.	All parts on the controlled surface must lie within the tolerance zone, which is parallel to a particular surface	4.	Parallelism
_____e.	The diameter of an imaginary cylinder which passes through the threads at a point where the groove and thread widths are equal	5.	Round
_____f.	To convey a measurement from one place to another	6.	Transfer
_____g.	A convex surface on the edge of a part	7.	Concentricity
_____h.	Distance from any point on the thread of a screw to a corresponding part on the adjacent thread, measured parallel to the axis	8.	Fillet
_____i.	Concave junction formed where two surfaces meet	9.	Pitch

2. Identify the gages illustrated below and on the following pages by writing the correct names in the blanks provided.

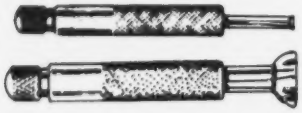


a. _____

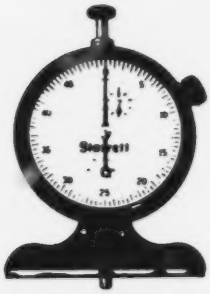


b. _____

c. _____

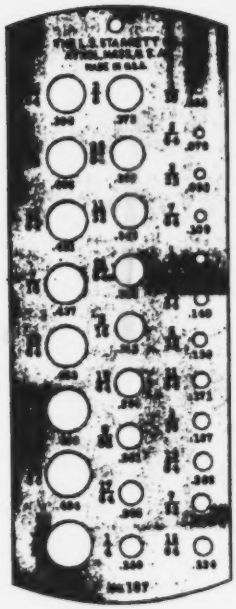


d. _____

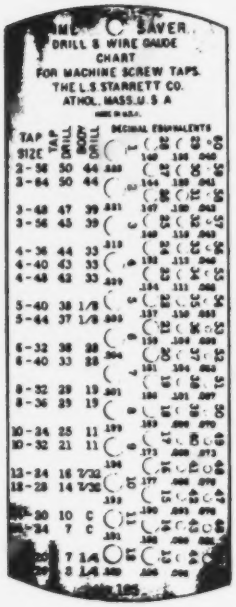


e. _____

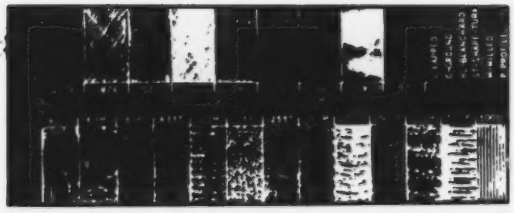
f. _____



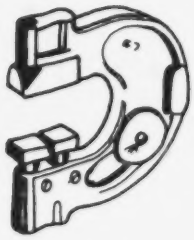
g. _____


DRILL & WIRE GAUGE
CHART
FOR MACHINE SCREW TAPS.
THE L.S. STARRETT CO.
ATHOL, MASS.U.S.A.

h. _____

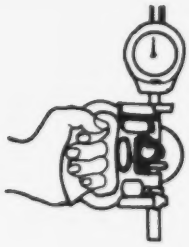


i. _____

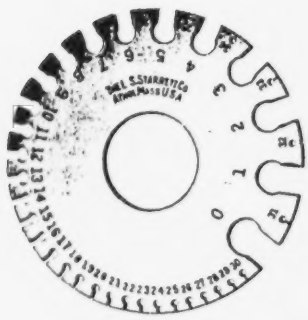


j. _____

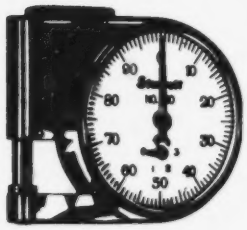
k. _____



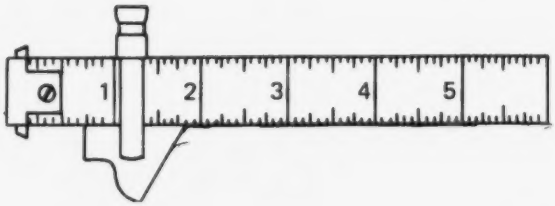
l. _____



m. _____ n. _____

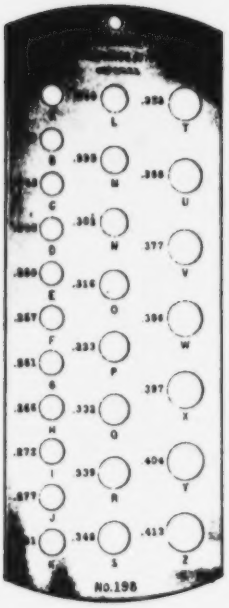


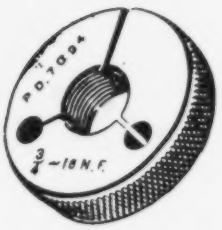
o. _____ p. _____

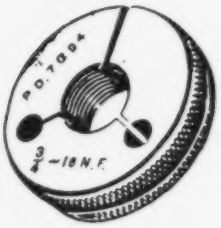


q. _____

r. _____

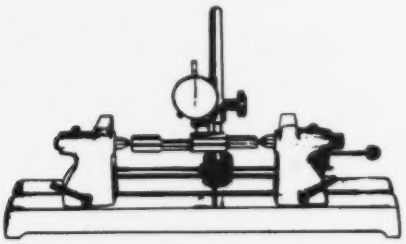




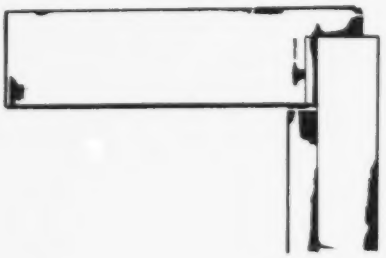


s. _____ t. _____

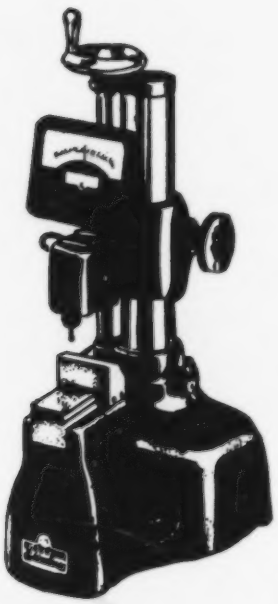
3. Identify the inspection tools shown in the following illustrations by writing the correct names in the blanks provided.



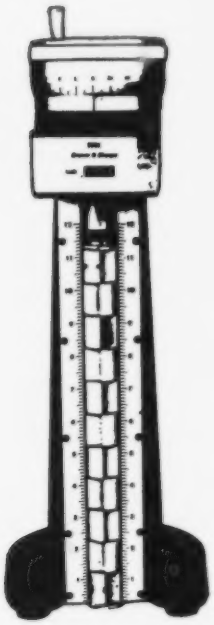
a. _____ b. _____



c. _____ d. _____

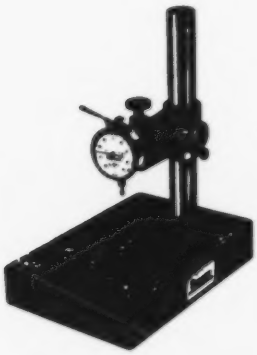


e. _____

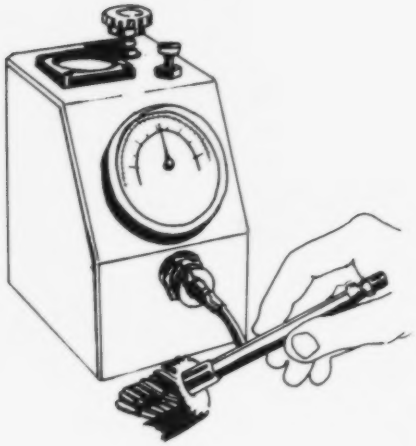


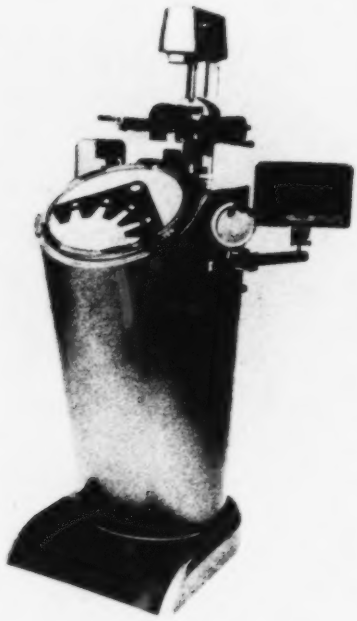
f. _____

g. _____



h. _____





i. _____ j. _____

k. _____

4. Describe the rules for the care of gaging and inspection tools by completing these statements.

   a. Storage -- When you are finished using the tools, _____

   _____

   _____

   b. Handling -- Always handle precision tools with care; never _____

   or lay _____

   _____

   c. Cleaning -- Wipe the tools with _____ after

   _____

   d. Inspecting -- Before using most gages and inspection tools, check them

   _____

   _____

   e. Lubricating -- Never lubricate the _____;

   however, other metal parts should be _____

   _____

5. Match the gaging tools on the right to their uses by writing the number of the tool beside its correct use in the blank provided. Uses continue on next page.

_____a.	Used to check 60° threading tool when grinding to shape, to set threading tool when cutting threads, and to check centers	1. Thread ring gage 2. Surface finish gage
_____b.	Used as fast method of checking the thickness of sheet material	3. Dial depth gage
_____c.	Used to measure small holes, slots and grooves by transferring measurements to an outside micrometer; range is 1/8" to 1/2"	4. Center gage 5. Thread plug ring
_____d.	Used to check the bore of parts to .0001" accuracy; must be present with a ring gage	6. Drill and steel wire gage 7. Cylindrical plug gage

_____e. Has "go" and "no-go" ends; used to check bore of parts to .0001" accuracy

_____f. Used to check the depth of holes, slots, grooves, and recesses

_____g. Used to visually compare the desired finish of a part to a certain known finish

_____h. Used to determine the pitch or number of threads per inch of a threaded part

_____i. Used to check parts within certain limits of a predetermined, fixed dimension

_____j. Used to measure holes, slots, and recesses by transferring measurements to outside micrometer; range is 5/16" to 6"

_____k. Has "go" and "no-go" threaded ends; used to check pitch diameter of internal threads

_____l. Used to check a radius or fillet

_____m. Used to check size of drills and steel wire

_____n. Used to check the pitch diameter of a threaded part

_____o. Used when drill grinding to determine the correct drill point angle

_____p. Used to set, check tools, and measure parts to .0001" accuracy

8. Ring gage
9. Telescoping gage
10. Dial thickness gage
11. Radius gage
12. Small hole gage
13. Screw pitch gage
14. Dial bore gage
15. Snap gages
16. Drill point gage

6. Match the inspection tools on the right to their correct uses by writing the number of the tool in the blank provided by its use. Uses continue on next page.

_____a. Used to check measurements, set fixed gages, calibrate measuring tools, set comparators, inspect, and perform other set-ups

_____b. Used as a visual method of inspection

1. Electronic comparator
2. Optical comparator
3. Cylindrical square
4. Pressure type air gage

_____c.	Used as a master square against which other squares may be checked	5.	Gage blocks
_____d.	Used to inspect size of parts from a flat surface	6.	Bevel edge steel square
_____e.	Used for inspection of parts to a very close tolerance with air flow	7.	Optical flat
_____f.	Used to inspect parts for squareness	8.	Sine bar
_____g.	Used to check concentricity of machined parts	9.	Height micrometer
_____h.	Used in inspection of parts; is preset and measures in the millionths of an inch (.000001)	10.	Bench center
_____i.	Uses light waves to measure flatness, parallelism, and size	11.	Comparator
_____j.	Used to set up or inspect angular surfaces of 45° or less		
_____k.	Used to set other measuring tools for inspection by comparison; accurate to .0001 of an inch		

7. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 7. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 7.

GAGING AND INSPECTION TOOLS
UNIT VII

LAP ASSIGNMENT SHEET #3--CALCULATE GAGE BLOCKS

NAME _____ SCORE _____

1. Working with the gage blocks shown in the 83 piece set listed below, write down the blocks you would use to obtain the dimensions given. Remember that each block can be used only once per set-up. Use as few of the blocks as possible for each set-up.

FIRST: .0001 Series – 9 Blocks

.1001	.1002	.1003	.1004	.1005	.1006	.1007	.1008	.1009

SECOND: .001 Series – 49 Blocks

.101	.102	.103	.104	.105	.106	.107	.108	.109
.110	.111	.112	.113	.114	.115	.116	.117	.118
.119	.120	.121	.122	.123	.124	.125	.126	.127
.128	.129	.130	.131	.132	.133	.134	.135	.136
.137	.138	.139	.140	.141	.142	.143	.144	.145
.146	.147	.148	.149					

THIRD: .050 Series – 19 Blocks

.050	.100	.150	.200	.250	.300	.350	.400	.450	.500
.550	.600	.650	.700	.750	.800	.850	.900	.950	

FOURTH: 1.000 Series – 4 Blocks

1.000	2.000	3.000	4.000

TWO .050 WEAR BLOCKS

a. 3.7776

_____

_____

_____

_____

_____

b. .4351

_____

_____

_____

_____

_____

c. 1.1616

_____

_____

_____

_____

_____

d. 4.0809

_____

_____

_____

_____

_____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 11. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 11.

GAGING AND INSPECTION TOOLS
UNIT VII

LAP ASSIGNMENT SHEET #4--USE TRIGONOMETRIC FUNCTION TABLES TO CALCULATE SINE BAR ELEVATION

NAME_____ SCORE_____

1. Use the trigonometric function tables provided by your instructor to complete this Assignment Sheet. Show your work in the space provided as you calculate the elevation required to set a 5" sine bar at the following angles.

a. 31° 61' = _____ b. 9° 0' = _____

c. 14° 14' = _____ d. 29° 58' = _____

e. 41° 37' = _____ f. 23° 7' = _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 15. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 15.

State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for MACHINE SHOP I

LAP NO. _____ CODE: _____

MAJOR INSTRUCTIONAL AREA

BASIC AND RELATED TECHNOLOGY

INSTRUCTIONAL UNIT

MATERIALS AND CUTTING FLUIDS
SECTION B--UNIT VIII

LEARNING ACTIVITY PACKET NO.

10

PREREQUISITE LAP(S)

1, 2, 5

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities and performance tasks for "Materials and Cutting Fluids." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training and in achieving a SKILLED or MODERATELY SKILLED competency level in the performance of jobs associated with this specialty.

INTRODUCTION: The course of study in this LAP will help the student become able to select the proper cutting speeds for different materials and describe the kind of cutting fluid that is best suited for a particular job.

TASKS INCLUDED IN THIS LAP:

1. Perform file and spark test.

MACHINE SHOP I
MATERIALS AND CUTTING FLUIDS
SECTION B--UNIT VIII

LEARNING STEPS

Check the Following
Blanks as You Complete
the Required Steps.

_____1.	Read	Unit and Specific Objectives, page 451-B.
_____2.	Complete	Materials and Cutting Fluids Pre-Test, LAP page 5.
_____3.	Study	The sections of the Information Sheet, pages 455-B through 465-B indicate by your instructor on your pre-test. Be sure to refer to the Transparency Masters when required.
_____4.	Refer	To Step 10 of your Pre-Test. If additional study is indicated in any of sections I, III, V, VI, VII, VIII, or IX, continue to Step 5. Otherwise, proceed to Step 7.
_____5.	Do	LAP Assignment Sheet #1, LAP Page 9.
_____6.	Do	LAP Assignment Sheet #2, LAP page 15.
_____7.	Refer	To Step 10 of your Pre-Test. If additional study is indicated in Section II, continue to Step 8. Otherwise, proceed to Step 11.
_____8.	Do	Assignment Sheet #1--Distinguish Between Metallic and Non-Metallic Materials, page 467-B.

_____9. Stop. Have your instructor evaluate Assignment Sheet #1. If your instructor is satisfied with your performance, proceed to Step 11. Otherwise, continue to Step 10.

_____10. Do LAP Assignment Sheet #3, LAP page 19.

_____11. Refer To Step 10 of your Pre-Test. If additional study is indicated for Section IV, continue to Step 12. Otherwise, proceed to Step 15.

_____12. Do Assignment Sheet #2--Interpret SAE/AISI Steel Numbering Systems, page 469-B.

_____13. Stop. Have your instructor evaluate Assignment Sheet #2. If your instructor is satisfied with your performance, proceed to Step 15. Otherwise, continue with Step 14.

_____14. Do LAP Assignment Sheet #4, LAP page 21.

_____15. Discuss Your competency in performing a file and spark test with your instructor. If your instructor feels that you are sufficiently competent in this task, proceed to Step 21. Otherwise, continue to Step 16

_____16. Study Job Sheet #1--Perform File and Spark Test, page 481-B.

_____17. Watch Slide/tape presentation "Perform File and Spark Test" (B-VIII-1).

_____18. Do Job Sheet #1--Perform File and Spark Test.

_____19. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, proceed to Step 21. Otherwise, repeat Steps 16-18 and then go to Step 20.

_____20. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, continue to Step 21. If additional study is required, discuss a program to help you attain sufficient competency with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Step 21.

_____21. Review Information Sheet (page 455-B) and Assignment Sheets 1 and 2.

_____22. Take Materials and Cutting Fluids Unit VIII Test (see your instructor). If your score is 85 percent or above, continue to the next Learning Activity Packet. If you do not score 85 percent or above, ask your instructor about additional study requirements and possible re-testing.

MATERIALS AND CUTTING FLUIDS
UNIT VIII

PRE-TEST

NAME_____ SCORE_____

DIRECTIONS: This test is to determine how much you already know about materials and cutting fluids. Your performance on this test will not be used to determine your grade in this course. Instead it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you know the answer. Guessing may prevent you from receiving the lessons which are required.

1. Match the terms on the right associated with materials and cutting fluids to the correct definitions by writing the number of the term in the blank provided next to the correct definition.

_____a.	Metal with iron as its major element; usually magnetic	1.	AISI (American Iron and Steel Institute)
_____b.	Professional group that sets many manufacturing standards	2.	Non-metallic
_____c.	Number of feet of material passing the cutting edge per minute	3.	Allowable cutting speed
_____d.	Metal that does not contain iron; not magnetic	4.	Non-ferrous
_____e.	Gives maximum tool life between grindings, with maximum chip or material removal	5.	SAE (Society of Automotive Engineers)
_____f.	Angles ground on or angles of cutting tools	6.	Metallic
_____g.	Having a decayed or rotten smell due to bacterial buildup; caused by contamination	7.	Sour
_____h.	Professional group that sets standards for steel	8.	Ferrous
_____i.	A metal material (ferrous or non-ferrous)	9.	Cutting speed
_____j.	A material without metal	10.	Tool bit geometry

2. Distinguish between ferrous, non-ferrous, and non-metallic materials. Write an "F" for ferrous, an "N" for non-ferrous, and "N-M" for non-metallic in the blanks provided.

_____a.	Rubber	_____g.	Alloy steel	_____m.	Type 410 stainless steel
_____b.	Tool steel	_____h.	Plastic		
_____c.	Cast aluminum	_____i.	Aluminum	_____n.	Cast iron
_____d.	Copper	_____j.	Bronze	_____o.	Wood
_____e.	Ceramic	_____k.	Lead	_____p.	High carbon steel
_____f.	Brass	_____l.	Mild steel	_____q.	Type 316 stainless steel

3. State how different materials affect tool geometry. _____

_____

_____

4. Identify the carbon content of the steels listed from the SAE/AISI numbering systems and write your answers in the spaces provided.

a. SAE 4140 = _____
b. SAE 4024 = _____
c. SAE 5046 = _____
d. AISI - E 2517 = _____
e. AISI - B 1113 = _____
f. AISI - C 1018 = _____

5. Describe factors that affect cutting speeds and tool bit geometry in the spaces below.

a. Machinability of material -- _____

_____

b. Hardness of material -- _____

_____

c. Toughness of material -- _____

_____

6. Match the methods for testing hardness on the right and carbon content of steels to their definitions by writing the number of the test in the blank beside its correct definition.

_____a. Test for hardness of materials; uses a carbide ball (B scale) or a cone-shaped diamond penetrator (C scale); measurers depth of penetration and converts this to a standard scale; primarily used for inspection, but can be used to check for machinability

1. File test
2. Brinell test
3. Spark test
4. Rockwell test

_____b. Test where metal displays a particular spark pattern when held against a grinding wheel; sparks are compared with known sample

_____c. Uses a ball penetrator to create impression on metal; diameter of impression is measured and converted mathematically

_____d. Test where metal is filed and ease or difficulty is noted

7. Match the kinds of cutting fluids listed on the right to their uses by writing the number of the fluid in the blank beside its correct use.

_____a. Used when tapping or drilling by hand

_____b. Mix with water; used when cooling work and tool with light lubricating action; wash chips from work

_____c. Used where cooling work and when there is high chip-bearing pressure, as in machining alloy or other tough steels

_____d. Used to cool work and tool, improve finish, wash chips from work; contain no oil

1. Chemical emulsions
2. Emulsifying or soluble oils
3. Light and dark cutting oils
4. Chemical cutting fluids

8. Describe six advantages of using cutting fluids in the spaces below.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

9. Describe five reasons for using chemical cutting fluids in the spaces below.

a. _____

b. _____

c. _____

d. _____

e. _____

10. Stop. Have your instructor evaluate your Pre-Test and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I_____	VI_____
II_____	VII_____
III_____	VIII_____
IV_____	IX_____
V_____	

If any of the above study areas is checked, continue to LAP Step 3. Otherwise, proceed to LAP Step 15.

BASIC AND RELATED TECHNOLOGY
UNIT VIII

LAP ASSIGNMENT SHEET #1--MATERIALS AND CUTTING FLUIDS

NAME_____ SCORE_____

1. Match these terms associated with materials and cutting fluids to their definitions by selecting the correct definition from the choices provided.

   1. AISI (American Iron and Steel Institute)

      _____a. Professional group which sets many manufacturing standards

      _____b. Angles ground on or angles of cutting tools

      _____c. Professional group that sets standards for steel

   2. Non-metallic:

      _____a. Metal with iron as its major element; usually magnetic

      _____b. Metal that does not contain iron; not magnetic

      _____c. A material without metal

   3. Allowable cutting speed:

      _____a. Number of feet of material passing the cutting edge per minute

      _____b. Gives maximum tool life between grindings, with maximum chip or material removal

      _____c. Angles ground on or angles of cutting tools

   4. Non-ferrous:

      _____a. Metal with iron as its major element; usually magnetic

      _____b. Metal that does not contain iron; not magnetic

      _____c. A material without metal

   5. SAE (Society of Automotive Engineers):

      _____a. Professional group that sets many manufacturing standards

      _____b. A metal material (ferrous or non-ferrous)

      _____c Professional group that sets standards for steel

6. Metallic:

_____a. Having a decayed or rotten smell due to bacterial buildup; caused by contamination

_____b. A metal material (ferrous or non-ferrous)

_____c. A material without metal

7. Sour:

_____a. Number of feet of material passing the cutting edge per minute

_____b. Angles ground on or angles of cutting tools

_____c. Having a decayed or rotten smell due to bacterial buildup; caused by contamination

8. Ferrous:

_____a. Metal with iron as its major element; usually magnetic

_____b. Metal that does not contain iron; not magnetic

_____c. A material without metal

9. Cutting speed:

_____a. Number of feet of material passing the cutting edge per minute

_____b. Gives maximum tool life between grindings, with maximum chip or material removal

_____c. Angles ground on or angles of cutting tools

10. Tool bit geometry:

_____a Gives maximum tool life between grindings with maximum chip or material removal

_____b. Angles ground on or angles of cutting tools

_____c. Having a decayed or rotten smell due to bacterial buildup; caused by contamination

3. State how different materials affect tool geometry by completing this statement: As a general rule, the _____ the metal, the more side clearance and side rake must be ground on the tool so that it has shearing action.

4. Describe these factors that affect cutting speeds and tool bit geometry by completing these statements.

a. Machinability of material -- How _____ or _____ a material is to cut.

b. Hardness of material -- Resistance to _____.

c. Toughness of material -- Resistance to _____.

5. Match methods for testing for hardness and carbon content of steels by selecting the correct choice of methods to do the test described.

1. Test for hardness of materials; uses a carbide ball (B scale) or a cone-shaped diamond penetrator (C scale); measures depth of penetration and converts this to a standard scale; primarily used for inspection, but can be used to check for machinability

_____a. File test

_____b. Rockwell test

_____c. Brinell test

2. Test where metal is filed and ease or difficulty is noted

_____a. File test

_____b. Spark test

_____c. Brinell test

3. Test where metal displays a particular spark pattern when held against a grinding wheel; sparks are compared with known sample

_____a. Spark test

_____b. Rockwell test

_____c. Brinell test

4. Uses a ball penetrator to create impression on a metal; diameter of impression is measured and converted mathematically

_____a. File test

_____b. Rockwell test

_____c. Brinell test

6. Match kinds of cutting fluids to their uses by selecting the proper cutting fluid to do the job described.

1. Tapping or drilling by hand

_____a. Emulsifying or soluble oil

_____b. Chemical emulsion

_____c. Chemical cutting fluid

2. Machining alloy with high chip-bearing pressure

   _____a. Light or dark cutting oil

   _____b. Emulsifying or soluble oil

   _____c. Chemical emulsion

3. Machining where an improved finish is desired

   _____a. Light or dark cutting oil

   _____b. Emulsifying or soluble oil

   _____c. Chemical emulsion

4. Machining where the work and tool need only be cooled and the chips washed away with water available for mixing

   _____a. Emulsifying or soluble oil

   _____b. Chemical emulsion

   _____c. Chemical cutting fluid

7. Describe the advantages of using cutting fluids by completing the statements below.

   a. They take _____ away from the part.

   b. They prolong the life of the _____ _____ of the tool.

   c. They help in _____ control by washing _____ away from the cutter.

   d. They help in machining parts to size by keeping the part _____.

   e. They help to _____ machine parts.

8. Describe reasons for using chemical cutting flids by completing the statements below.

   a. They will not sour as fast as _____ oils due to the lack of bacterial-forming agents.

   b. They are/are not anti-allergenic. (Cross out the incorrect choice)

   c. They are easy to _____.

   d. They do not _____ the machine.

   e. They are not irritating to the _____ and throat.

9. Stop. Have your instructor evaluate your Assignment Sheet and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I_____ VII_____

III_____ VIII_____

V_____ IX_____

VI_____

If any of the above areas is checked, review the required section(s) of the Information Sheet and then continue to LAP Step 6. Otherwise, proceed to LAP Step 7.

BASIC AND RELATED TECHNOLOGY
UNIT VIII

LAP ASSIGNMENT SHEET #2--MATERIALS AND CUTTING FLUIDS

NAME_____ SCORE_____

1. Match terms on the right associated with materials and cutting fluids to their definitions by writing the number of the term in the blank beside the correct definition.

_____a.	Metal with iron as its major element; usually magnetic	1. Sour
_____b.	Professional group that sets many manufacturing standards	2. Ferrous
_____c.	Number of feet of material passing the cutting edge per minute	3. AISI (American Iron and Steel Institute)
_____d.	Metal that does not contain iron; not magnetic	4. Non-metallic
_____e.	Gives maximum tool life between grindings, with maximum chip or material removal	5. Allowable cutting speed
_____f.	Angles ground on or angles of cutting tools	6. SAE (Society of Automotive Engineers)
_____g.	Having a decayed or rotten smell due to bacterial buildup; caused by contamination	7. Cutting speed
_____h.	Professional group that sets standards for steel	8. Metallic
_____i.	A metal material (ferrous or non-ferrous)	9. Non-ferrous
_____j.	A material without metal	10. Tool bit geometry

3. State how different materials affect tool geometry by completing this statement: As a general rule, the softer the metal, the more _____ _____ and _____ _____ must be ground on the tool so that it has a _____ _____.

4. Describe factors that affect cutting speeds and tool bit geometry by completing the following statements.

   a. Machinability of material -- How _____ or _____ a material is to _____.

b. Hardness of material -- _____ to _____.

c. Toughness of material -- _____ to _____.

5. Match methods for testing for hardness and carbon content of steels to their definitions. Write the correct numbers in the blanks provided.

_____a.	Test for hardness of materials; uses a carbide ball (B scale) or a cone-shaped diamond penetrator (C scale); measures depth of penetration and converts this to a standard scale; primarily used for inspection, but can be used to check for machinability	1.	Spark test
		2.	File test
		3.	Rockwell test
		4.	Brinell test
_____b.	Test where metal displays a particular spark pattern when held against a grinding wheel; sparks are compared with known sample		
_____c.	Uses a ball penetrator to create impression on metal; diameter of impression is measured and converted mathematically		
_____d.	Test where metal is filed and ease or difficulty is noted		

6. Match kinds of cutting fluids to their uses. Write the correct numbers in the blanks provided.

_____a.	Used when tapping or drilling by hand	1.	Light and dark cutting oils
_____b.	Mix with water; used when cooling work and tool with light lubricating action; wash chips from work	2.	Emulsifying or soluble oils
_____c.	Used where cooling work and when there is high chip-bearing pressure, as in machining alloy or other tough steels	3.	Chemical emulsions
		4.	Chemical cutting fluids
_____d.	Used to cool work and tool, improve finish, wash chips from work; contain no oil		

7. Describe advantages of using cutting fluids in the spaces below by explaining how cutting fluids can affect each of the following.

a. Heat -- _____
b. Life of cutting edge -- _____
c. Chips -- _____
d. Finish -- _____
e. Machining to size -- _____
f. Machine parts -- _____

8. Describe reasons for using chemical cutting fluids in the spaces below by explaining how each of the following apply to the use of chemical cutting fluids.

   a. Souring -- _____
   b. Allergies -- _____
   c. Cleaning -- _____
   d. Staining -- _____
   e. Irritation -- _____

9. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 7. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 7.

MATERIALS AND CUTTING FLUIDS
UNIT VIII

LAP ASSIGNMENT SHEET #3--DISTINGUISH BETWEEN METALLIC AND NON-METALLIC MATERIALS

NAME_____ SCORE_____

1. Distinguish between each of the following materials as being metallic or non-metallic. For the metals, describe them as either ferrous or non-ferrous. Write an "N" in the blank for non-metallic materials, an "F" for a ferrous metal, and an "NF" for a non-ferrous metal.

_____a.	Aluminum	_____k.	High carbon steel
_____b.	Ceramic	_____l.	Lead
_____c.	Zinc	_____m.	Plastic
_____d.	Wood	_____n.	Glass
_____e.	Type 410 stainless steel	_____o.	Alloy steel
_____f.	Bronze	_____p.	Copper
_____g.	Teflon	_____q.	Silver
_____h.	Mild steel	_____r.	Brass
_____i.	Cast aluminum	_____s.	Type 316 stainless steel
_____j.	Tool steel	_____t.	Rubber

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 11. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 11.

MATERIALS AND CUTTING FLUIDS
UNIT VIII

LAP ASSIGNMENT SHEET #4--INTERPRET SAE/AISI STEEL NUMBERING SYSTEMS

NAME_____ SCORE_____

1. Use the tables in the student notebook pages 471-B through 477-B to list the carbon content of each steel listed below and the approximate cutting speed (CS) for finishing.

Steel	Carbon Content	Cutting Speed (CS)
AISI 4615		
SAE 1138		
SAE 5135		
AISI C 1055		
AISI C 1095		
SAE 8745		
SAE 50100		
AISI 321		
SAE 4119		

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 15. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 15.